

**SITE INSPECTION WORKSHEETS**

(Region I version 6/2/94)

**WARNING!!**

EPA has determined that the status and HRS score of any site that is progressing towards listing on the NPL is a pre-decisional, formal rule making process and therefore deliberations regarding listing issues, the site specific status, and HRS scores cannot be released or discussed with non-Agency persons. For additional guidance, see the April 30, 1993 OSWER Directive 9320.1-11.

Document Control No. 7710-023-DD-BQMH

**SITE LOCATION**

<b>SITE NAME:</b> Pine Swamp			
<b>STREET ADDRESS:</b> 495 Putnam Avenue			
<b>CITY:</b> Hamden	<b>STATE:</b> CT	<b>ZIP CODE:</b> 06514	<b>TELEPHONE:</b>
<b>CERCLIS ID#:</b> CTD980521082		<b>COORDINATES:</b> Latitude: 41°20'52"N Longitude: 72°55'30"W	

**OWNER/OPERATOR IDENTIFICATION**

<b>OWNER:</b> Olin Corporation (Olin)			<b>OPERATOR:</b> Redding Thompson, Olin		
<b>OWNER ADDRESS:</b> 120 Long Ridge Road, P.O. Box 1355			<b>OPERATOR ADDRESS:</b> Same as Owner		
<b>CITY:</b> Stamford			<b>CITY:</b>		
<b>STATE:</b> CT	<b>ZIP CODE:</b> 06904	<b>TELEPHONE:</b> (203) 356-2732	<b>STATE:</b>	<b>ZIP CODE:</b>	<b>TELEPHONE:</b>

**SITE EVALUATION**

<b>AGENCY/ORGANIZATION:</b> CDM Federal Programs Corporation	<b>Corporation TDD No.:</b> 9305-18-ACX
<b>INVESTIGATOR:</b> Andrea Ferro	<b>DATE:</b> April 19, 1995

**EPA CONTACT**

<b>EPA SAM:</b> Nancy Smith		
<b>ADDRESS:</b> JFK Federal Building		
<b>CITY:</b> Boston	<b>STATE:</b> MA	<b>ZIP CODE:</b> 02203
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<b>EPA REVIEWER:</b> Don Smith		<b>DATE:</b> 3-17-95

## GENERAL INFORMATION

### Site Description and Operational History:

Pine Swamp is located on a 103.6 acre property in Hamden, Connecticut (Latitude 41° 20' 52" N, Longitude 72° 55' 30" W) [3,23,46]. The property, owned by Olin Corporation of Stamford, Connecticut, consists of several paved and unpaved roads, wooded hills and 5 interconnected ponds with several wetland areas surrounding the ponds [3]. The ponds are hydrologically connected to Lake Whitney, a former public drinking water reservoir formed by a dam on the Mill River [3,12,46]. The only structure remaining on the property is a 14-foot by 20-foot wooden shed in the southern corner of the property, which houses a soil vapor extraction system. However, the area surrounding the Pine Swamp property is urban, including industrial, commercial and residential sectors. The property is enclosed with a chain-link fence with an access gate at Putnam Avenue [3].

Around 1890, the Winchester Repeating Arms Company (Winchester) of New Haven, Connecticut, purchased approximately 200 acres near Putnam Avenue and constructed what is now Treadwell Avenue to establish the north boundary of the Pine Swamp property [25]. For approximately 60 years, Winchester, owned by Olin Corporation, stored gunpowder on the property. In addition, shotgun, small caliber rifle, machine gun, and artillery shells, as well as mortar rounds were tested at firing ranges on the Pine Swamp property. Approximately 35 bunkers were constructed throughout the property for storage of the gun powder [3,6,30]. Thus, the local name for the Pine Swamp property, the "Powder Farm," was established. In 1964, approximately 100 acres of the original property was sold off in parcels, leaving a 102.8 acre property [6,30].

Olin Corporation also used the Pine Swamp property for the disposal and incineration of materials generated at the New Haven Winchester plant, including "wood, demolition debris, miscellaneous metals and glass, trash, waste gunpowder and solvent chemicals, off specification dry cell batteries, concrete test pads, trap sands from firing ranges and incinerator ash" [6,30]. Waste disposal and incineration operations at the Pine Swamp property, which were located primarily in the southwestern corner of the property, began in the late 1950s and continued until the late 1960s [3,30].

In 1966, a private citizen complaint to the Hamden Health Department initiated the cessation of disposal and the commencement of restoration of the Pine Swamp property. Olin Corporation entered into a Consent Order with the Connecticut Department of Environmental Protection (CTDEP) in January 1986 to identify and remediate contaminated areas on the property. Also in 1986, Olin Corporation purchased 0.75 acres from the Anixter AED Company in 1986, forming the current 103.6 acre property). The December 1988 Remedial Investigation Study (RIS) identified the following six major areas for further study and remediation: the East Burning Grounds, the West Burning Grounds, the Battery Waste Area, the Anixter Area, the Southeast Kettle Area, and the Incinerator Ash Area [30]. These areas, in addition to the Shotgun-Proofing Area and the Trap Sands, are discussed further in the Source Description.

CDM conducted onsite reconnaissance activities on May 11, 1994. The CDM field crew met with a representative from Olin and a representative from Olin's consulting firm, Malcolm Pirnie. CDM conducted sediment sampling at the Pine Swamp property and groundwater

sampling at a nearby drinking water well on August 23, 1994. Results of the CDM sediment sampling indicated the presence of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, and inorganic analytes at greater than three times the reference concentration. Results of the groundwater sampling indicated the presence of one VOC (chloroform) and several inorganic analytes. The groundwater samples were collected from the [redacted] well, 0.2 mile south and in the opposite direction of the known groundwater flow from the Pine Swamp source areas [33,34,35,36].

Further details on the site activity are given below [1,3,6,7,27,28,29,30,31,32].

### Site Activity at Pine Swamp

#### Date

#### Activity

February 1966

Private citizen complaint filed with the Hamden Health Department concerning dumping and burning of wastes in area of Putnam Avenue and Dixwell Avenue in Hamden, Connecticut.

March 1966

Hearing in office of Hamden Health Department directed Olin Corporation to cease transporting materials to site, to cease burning combustible material and to remove all non-combustible debris.

June 1966

Hamden Health Department follow-up inspections found chemical wastes removed and pits used for waste disposal and burning backfilled with clean fill.

1973

Thirty-five concrete bunkers used for storage of the gunpowder were demolished and removed.

1979

Olin Corporation submitted a report to Congressional Subcommittee on Oversight and Investigation of Chemical Waste Disposal acknowledging disposal, incineration, and possible burial of industrial wastes (organics, metals, highly volatile acids).

January 1981

Phase I Report prepared by Environmental Research and Technology, Inc. (ERT) included hydrological investigation of test pits in disposal areas, installation of monitoring wells, sampling and analysis of groundwater, surface water, and sediment from ponds.

June 1982

Phase II report prepared by ERT included installation of additional borings and wells, and sampling of groundwater, surface water, and sediment from ponds. Results of sampling indicated onsite contamination in all three media.

January 1983

PA performed by NUS Corporation.

January 1984 CTDEP ordered the Anixter AED Company to remove contaminated soil.

April 1984 Removal and backfill of soil by Anixter AED Company and installation of monitoring wells.

June 1985 SI sampling, including soil, surface water and groundwater, performed by NUS Corporation.

January 1986 Consent Order signed by Olin Corporation and CTDEP Water Compliance Division for further investigation and remediation of site.

December 1988 Remedial Investigation Study prepared by Malcolm Pirnie including Clean Sites Inc.'s letter of certification.

1989 Olin Corporation initiated quarterly monitoring of industrial process water well at abutting property.

April 1990 210 cubic yards of contaminated soil excavated from the West Burning Grounds area and 180 cubic yards of exposed lead contaminated ballistic trap sand excavated from sand traps piles throughout the site. Excavated material disposed of at an EPA permitted hazardous waste facility.

September 1990 200 cubic yards of debris, timbers, structural metal and rubble excavated from the Southeast Kettle area and transported to the Wallingford Landfill (EPA ID CTD991288960) for disposal.

April 1991 Site wide groundwater monitoring conducted by Malcolm Pirnie.

June 1991 "Olin Pine Swamp Interim Corrective Measures Report" prepared by Malcolm Pirnie.

June 1991 Anixter Area polychlorinated biphenyls soil characterization performed by Malcolm Pirnie.

August 1992 Site wide groundwater monitoring conducted by Malcolm Pirnie.

September 1992 Anixter Area "Site Investigation and Exposure Assessment" report completed.

April 1993 Onsite groundwater monitoring conducted by Malcolm Pirnie.

March 1994 Anixter Area vapor extraction system put on line by VAPEX Environmental Technologies, Inc. (VAPEX) for removal of VOCs.

May 1994 Site reconnaissance performed by CDM for SIP.

April 1994

Onsite groundwater monitoring conducted by Malcolm Pirnie.

April 1994

Anixter Site Status Report No. 1 prepared by VAPEX.

June 1994

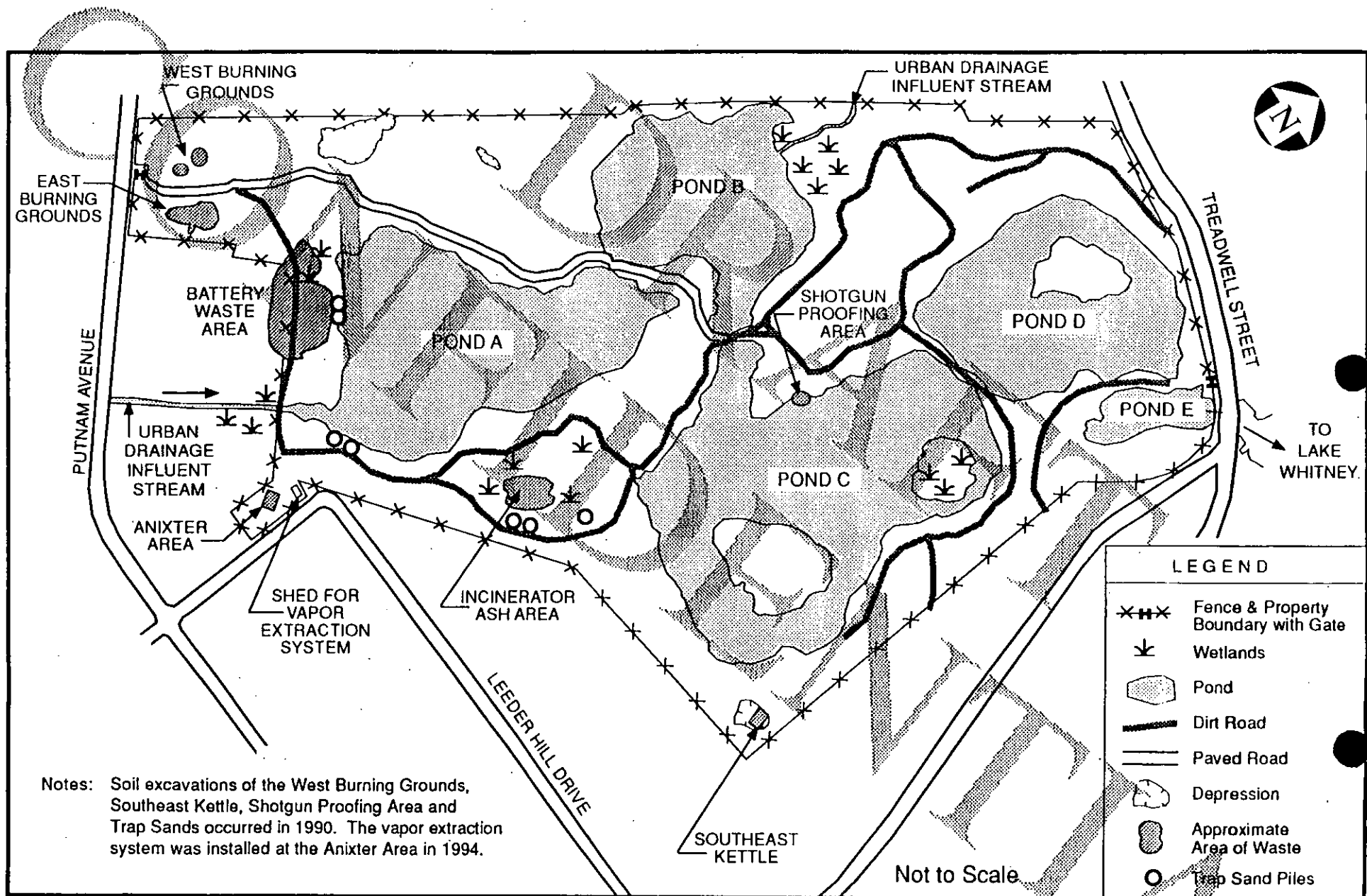
Anixter Site Status Report No. 2 prepared by VAPEX.

August 1994

Sediment and groundwater sampling conducted by CDM for SIP.

October 1994

Anixter Site Status Report No. 3 prepared by VAPEX.

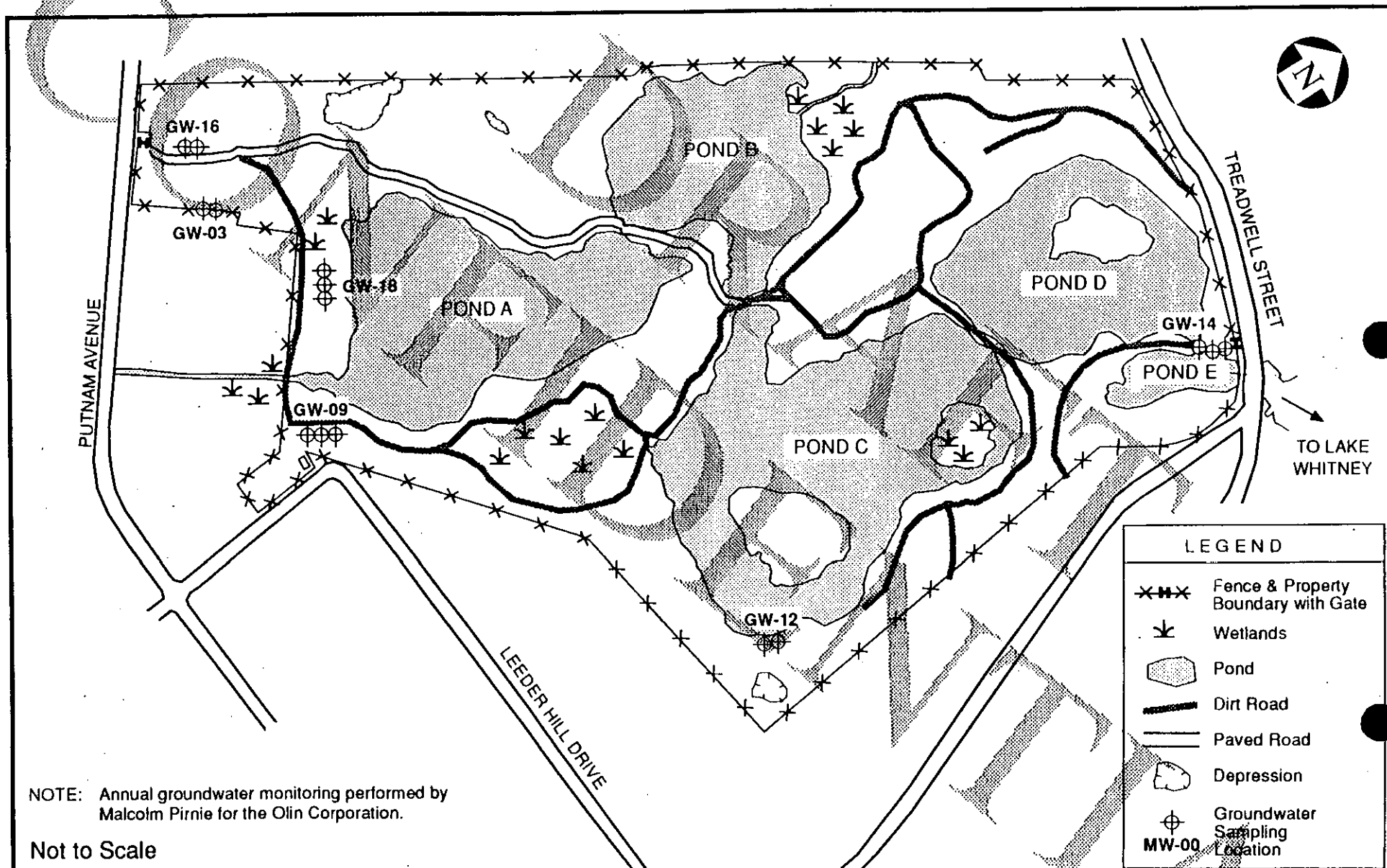


**SITE SKETCH**  
**PINE SWAMP**  
**HAMDEN, CONNECTICUT**

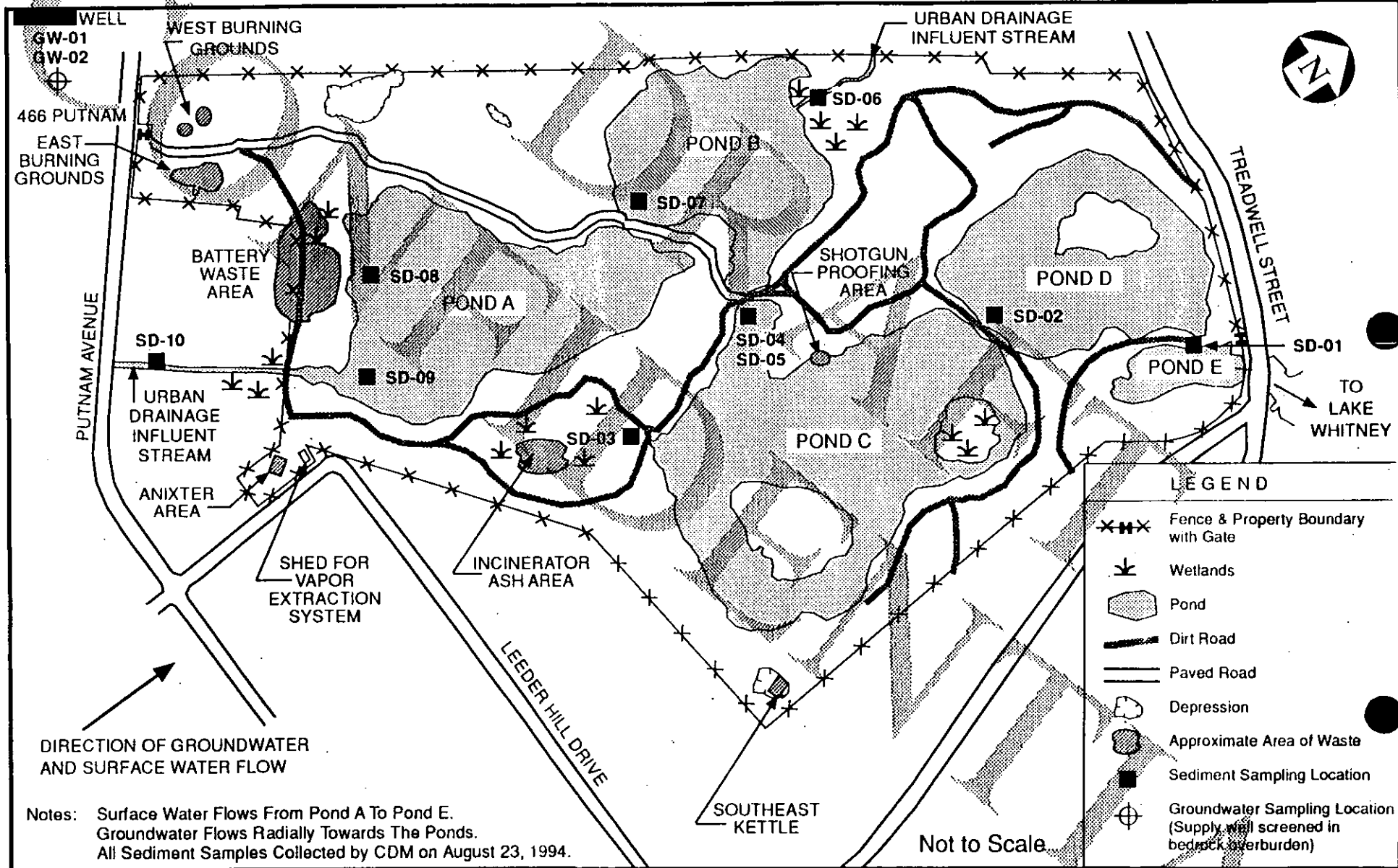


CDM FEDERAL PROGRAMS CORPORATION  
 a subsidiary of Camp Dresser & McKee Inc.

**Figure 1**



**ANNUAL GROUNDWATER MONITORING LOCATIONS**  
**PINE SWAMP**  
**HAMDEN, CONNECTICUT**



## SITE SKETCH WITH SEDIMENT SAMPLING LOCATIONS

**PINE SWAMP  
HAMDEN, CONNECTICUT**



## GENERAL INFORMATION (continued)

Source Description: Include description of containment per pathway for ground water (see HRS Table 3-2), surface water (see HRS Table 4-2), and air (see HRS Table 6-3 and 6-9).

Pine Swamp currently contains four principal areas of contaminated soil: the East Burning Grounds, the Battery Waste Area, the Anixter Area and the Incinerator Ash Area. Other past disposal areas which have been excavated include the West Burning Grounds, the Southeast Kettle, the Shotgun Proofing Area, and seven lead contaminated ballistic trap sand areas. All areas of past and present contamination are described in the following table [27,30]:

Disposal Area	Estimated Area (ft <sup>2</sup> )	Estimated Depth (ft)	Estimated Volume (yd <sup>3</sup> )	Excavated Volume (yd <sup>3</sup> )	Primary Contaminants
1. East Burning Grounds	10,000	2 to 6	1,200	0	VOCs
2. Battery Waste Area	43,560	2 to 12	7,000	0	VOCs, Semi-volatiles, Metals
3. Anixter Area	1,000	30	1,000	1,608 *	VOCs, PCBs
4. Incinerator Ash Area	29,000	2	2,140	0	VOCs, Semi-volatiles, Metals
5. West Burning Grounds	1,850	4.5	300	592	VOCs, PCBs, Semi-volatiles, Metals, Debris
6. Southeast Kettle	525	5	100	200	Low VOCs, Debris
7. Shotgun Proofing Area	1,200	1	2	15	Debris
8. Trap Sand Areas	3,000	0 to 4	50	180	Lead

**NOTES:**

\*1,608 cubic yards were excavated from the Anixter Area by Anixter AED Co. prior to estimation of contaminated area in the December 1988 RIS.

PCBs = Polychlorinated biphenyls

Malcolm Pirnie estimated volumes of waste using an electromagnetic terrain conductivity meter, which detects changes in conductivity values over background to delineate contamination boundaries. Therefore, the estimated volume in the above table and in the following calculations is not a product of the estimated area and depth, but a result of the electromagnetic terrain conductivity measurements.

No containment factors exist for groundwater, surface water or air pathways [3,30].

Hazardous Waste Quantity (HWQ) Calculation: SI Tables 1 and 2 (See HRS Tables 2-5, 2-6, and 5-2)

1. East Burning Grounds

Tier A: Insufficient information

Tier B: Insufficient information

Tier C: Volume of Contaminated Soil = 1,200 (yd<sup>3</sup>)  
$$\frac{1,200}{2,500} = 0.48$$

Tier D: Area of Contaminated Soil = 10,000 (ft<sup>2</sup>)  
$$\frac{10,000}{34,000} = 0.29$$

2. Battery Waste Area

Tier A: Insufficient information

Tier B: Insufficient information

Tier C: Volume of Contaminated Soil = 7,000 (yd<sup>3</sup>)  
$$\frac{7,000}{2,500} = 2.80$$

Tier D: Area of Contaminated Soil = 43,560 (ft<sup>2</sup>)  
$$\frac{43,560}{34,000} = 1.28$$

3. Anixter Area

Tier A: Insufficient information

Tier B: Insufficient information

Tier C: Volume of Contaminated Soil = 1,000 (yd<sup>3</sup>)  
$$\frac{1,000}{2,500} = 0.40$$

Tier D: Area of Contaminated Soil = 1,000 (ft<sup>2</sup>)  
$$\frac{1,000}{34,000} = 0.03$$

#### 4. Incinerator Ash Area

Tier A: Insufficient information

Tier B: Insufficient information

Tier C: Volume of Contaminated Soil = 2,140 (yd<sup>3</sup>)  
$$\frac{2,140}{2,500} = 0.86$$

Tier D: Area of Contaminated Soil = 29,000 (ft<sup>2</sup>)  
$$\frac{29,000}{34,000} = 0.85$$

#### 5. West Burning Grounds

Tier A: Insufficient information

Tier B: Insufficient information

Tier C: Volume of Contaminated Soil = 592 (yd<sup>3</sup>)  
$$\frac{592}{2,500} = 0.24$$

Tier D: Area of Contaminated Soil = 1,850 (ft<sup>2</sup>)  
$$\frac{1,850}{34,000} = 0.05$$

#### 6. Southeast Kettle

Tier A: Insufficient information

Tier B: Insufficient information

Tier C: Volume of Contaminated Soil = 200 (yd<sup>3</sup>)  
$$\frac{200}{2,500} = 0.08$$

Tier D: Area of Contaminated Soil = 10,000 (ft<sup>2</sup>)  
$$\frac{525}{34,000} = 0.02$$

Note: The initial estimated volume of contaminated soil was 300 yd<sup>3</sup>; however, Olin Corporation excavated a total of 592 yd<sup>3</sup> of soil based on sampling performed between excavations.

## 7. Shotgun Proofing Areas

Tier A: Insufficient information

Tier B: Insufficient information

Tier C: Volume of Contaminated Soil = 15 (yd<sup>3</sup>)  
$$15 \div 2,500 = 0.006$$

Tier D: Area of Contaminated Soil = 1,200 (ft<sup>2</sup>)  
$$1,200 \div 34,000 = 0.04$$

Note: The shotgun proofing area was excavated and contained debris only. Therefore, it will not be considered further as a source.

## 8. Trap Sand Areas

Tier A: Insufficient information

Tier B: Insufficient information

Tier C: Volume of Contaminated Soil = 180 (yd<sup>3</sup>)  
$$180 \div 2,500 = 0.07$$

Tier D: Area of Contaminated Soil = 3,000 (ft<sup>2</sup>)  
$$3,000 \div 34,000 = 0.09$$

Tier C has a larger waste quantity for the East Burning Grounds, Battery Waste Area, Anixter Area, Incinerator Ash Area, West Burning Grounds, and Southeast Kettle. Tier D has a larger waste quantity for the Shotgun Proofing Areas and Trap Sand Areas. Therefore, the sum of the larger waste quantity values is 4.99. Because the hazardous quantity data are not complete, the hazardous waste quantity score equals 10.

HWQ = 10

Note: Soil excavations of the West Burning Grounds, Southeast Kettle, Shotgun Proofing Area, and Trap Sands occurred in 1990, following the 1985 Site Inspection. Therefore, estimated volumes of contaminated soil before excavation are used. However, the hazardous waste quantity score equals 10 regardless of whether the removal quantities are taken into consideration.

**SI TABLE 1: HAZARDOUS WASTE QUANTITY (HWQ) SCORES FOR SINGLE SOURCE SITES AND FORMULAS FOR MULTIPLE SOURCE SITES**

TIER	Source Type	Single Source Sites (assigned HWQ scores)				Multiple Source Sites
		HWQ = 10	HWQ = 100	HWQ = 10,000	HWQ = 1,000,000	Divisors for Assigning Source WQ Values
<b>A</b> Hazardous Constituent Quantity	N/A	HWQ = 1 if Hazardous Constituent Quantity data are complete  HWQ = 10 if Hazardous Constituent Quantity data are not complete	> 100 to 10,000 lbs	> 10,000 to 1 million lbs	> 1 million lbs	lbs ÷ 1
<b>B</b> Hazardous Wastestream Quantity	N/A	≤ 500,000 lbs	> 500,000 to 50 million lbs	> 50 million to 5 billion lbs	> 5 billion lbs	lbs ÷ 5,000
<b>C</b> Volume	Landfill	≤ 6.75 million ft <sup>3</sup> ≤ 250,000 yd <sup>3</sup>	> 6.75 million to 675 million ft <sup>3</sup> > 250,000 to 25 million yd <sup>3</sup>	> 675 million to 67.5 billion ft <sup>3</sup> > 25 million to 2.5 billion yd <sup>3</sup>	> 67.5 billion ft <sup>3</sup> > 2.5 billion yd <sup>3</sup>	ft <sup>3</sup> ÷ 67,500 yd <sup>3</sup> ÷ 2,500
	Surface impoundment	≤ 6,750 ft <sup>3</sup> ≤ 250 yd <sup>3</sup>	> 6,750 to 675,000 ft <sup>3</sup> > 250 to 25,000 yd <sup>3</sup>	> 675,000 to 67.5 million ft <sup>3</sup> > 25,000 to 2.5 million yd <sup>3</sup>	> 67.5 million ft <sup>3</sup> > 2.5 million yd <sup>3</sup>	ft <sup>3</sup> ÷ 67.5 yd <sup>3</sup> ÷ 2.5
	Drums	≤ 1,000 drums	> 1,000 to 100,000 drums	> 100,000 to 10 million drums	> 10 million drums	drums ÷ 10
	Tanks and non-drum containers	≤ 50,000 gallons	> 50,000 to 5 million gallons	> 5 million to 500 million gals	> 500 million gals.	gallons ÷ 500
	Contaminated soil	≤ 6.75 million ft <sup>3</sup> ≤ 250,000 yd <sup>3</sup>	> 6.75 million to 675 million ft <sup>3</sup> > 250,000 to 25 million yd <sup>3</sup>	> 675 million to 67.5 billion ft <sup>3</sup> > 25 million to 2.5 billion yd <sup>3</sup>	> 67.5 billion ft <sup>3</sup> > 2.5 billion yd <sup>3</sup>	ft <sup>3</sup> ÷ 67,500 yd <sup>3</sup> ÷ 2,500
	Pile	≤ 6,750 ft <sup>3</sup> ≤ 250 yd <sup>3</sup>	> 6,750 to 675,000 ft <sup>3</sup> > 250 to 25,000 yd <sup>3</sup>	> 675,000 to 67.5 million ft <sup>3</sup> > 25,000 to 2.5 million yd <sup>3</sup>	> 67.5 million ft <sup>3</sup> > 2.5 million yd <sup>3</sup>	ft <sup>3</sup> ÷ 67.5 yd <sup>3</sup> ÷ 2.5
	Other	≤ 6,750 ft <sup>3</sup> ≤ 250 yd <sup>3</sup>	> 6,750 to 675,000 ft <sup>3</sup> > 250 to 25,000 yd <sup>3</sup>	> 675,000 to 67.5 million ft <sup>3</sup> > 25,000 to 2.5 million yd <sup>3</sup>	> 67.5 million ft <sup>3</sup> > 2.5 million yd <sup>3</sup>	ft <sup>3</sup> ÷ 67.5 yd <sup>3</sup> ÷ 2.5

**SI TABLE 1: HAZARDOUS WASTE QUANTITY (HWQ) SCORES FOR SINGLE SOURCE SITES AND FORMULAS FOR MULTIPLE SOURCE SITES**

TIER	Source Type	Single Source Sites (assigned HWQ scores)				Multiple Source Sites
		HWQ = 10	HWQ = 100	HWQ = 10,000	HWQ = 10,000,000	Divisors for Assigning Source WQ Values
<b>D Area</b>	Landfill	$\leq 340,000$ ft <sup>2</sup> $\leq 7.8$ acres	$> 340,000$ to 34 million ft <sup>2</sup> $> 7.8$ to 780 acres	$> 34$ million to 3.4 billion ft <sup>2</sup> $> 780$ to 78,000 acres	$> 3.4$ billion ft <sup>2</sup> $> 78,000$ acres	ft <sup>2</sup> $\div$ 3,400 acres $\div$ 0.078
	Surface Impoundment	$\leq 1,300$ ft <sup>2</sup> $\leq 0.029$ acres	$> 1,300$ to 130,000 ft <sup>2</sup> $> 0.029$ to 2.9 acres	$> 130,000$ to 13 million ft <sup>2</sup> $> 2.9$ to 290 acres	$> 13$ million ft <sup>2</sup> $> 290$ acres	ft <sup>2</sup> $\div$ 13 acres $\div$ 0.00029
	Contaminated Soil	$\leq 3.4$ million ft <sup>2</sup> $\leq 78$ acres	$> 3.4$ million to 340 million ft <sup>2</sup> $> 78$ to 7,800 acres	$> 340$ million to 34 billion ft <sup>2</sup> $> 7,800$ to 780,000 acres	$> 34$ billion ft <sup>2</sup> $> 780,000$ acres	ft <sup>2</sup> $\div$ 34,000 acres $\div$ 0.78
	Pile	$\leq 1,300$ ft <sup>2</sup> $\leq 0.029$ acres	$> 1,300$ to 130,000 ft <sup>2</sup> $> 0.029$ to 2.9 acres	$> 130,000$ to 13 million ft <sup>2</sup> $> 2.9$ to 290 acres	$> 13$ million ft <sup>2</sup> $> 290$ acres	ft <sup>2</sup> $\div$ 13 acres $\div$ 0.00029
	Land treatment	$\leq 27,000$ ft <sup>2</sup> $\leq 0.62$ acres	$> 27,000$ to 2.7 million ft <sup>2</sup> $> 0.62$ to 62 acres	$> 2.7$ million to 270 million ft <sup>2</sup> $> 62$ to 6,200 acres	$> 270$ million ft <sup>2</sup> $> 6,200$ acres	ft <sup>2</sup> $\div$ 270 acres $\div$ 0.0062

1 ton = 2,000 lbs = 1 yd<sup>3</sup> = 4 drums = 200 gallons

**SI TABLE 2: HWQ SCORES FOR MULTIPLE SOURCE SITES**

Site WQ Total	HWQ Score
0	0
1 <sup>a</sup> to 100	1 <sup>b</sup>
$> 100$ to 10,000	100
$> 10,000$ to 1,000,000	10,000
$> 1,000,000$	1,000,000

<sup>a</sup> If the WQ total is between 0 and 1, round it to 1.

<sup>b</sup> If the hazardous constituent quantity data are not complete, assign the score of 10.

# SI Table 3: WASTE CHARACTERIZATION WORKSHEETS

Pine Swamp

Hamden, Connecticut

CERCLIS ID Number: CTD980521082

SCDM Version: June 1994

Sources:

1. East Burning Grounds

2. Battery Waste Area

3. Anixter Area

References: 1,6,7,27,28,29,30,31,32,33,34,35,36,43

4. Incinerator Ash Area

5. West Burning Grounds

6. Southeast Kettle

7. Trap Sands

8. Groundwater Sampling (April 22, 1993)

9. Groundwater Monitoring (November 1986 through April 1993)

S o u r c e	Hazardous Substance	Toxicity	GROUND WATER PATHWAY		SURFACE WATER PATHWAY										GROUND WATER TO SURFACE WATER				Air Gas Mob.
			GW Mobility (HRS Table 3-8)	Tox./Mobility Value (HRS Table 3-9)	OVERLAND/FLOOD MIGRATION										Tox./Mob./Pers./Bioacc. Value (HRS Table 4-26)	Ecotox./Mob./Pers./Bioacc. Value (HRS Table 4-29)	Ecotox./Mob./Pers./Bioacc. Value (HRS Table 4-30)		
					Pers. (HRS Tables 4-10 & 4-11)	Tox./Pers. Value (HRS Table 4-12)	Bioacc. Pot. (HRS Table 4-13)	Tox./Pers./Bioacc. Value (HRS Table 4-16)	Ecotox. (HRS Table 4-19)	Pers. (HRS Table 4-20)	Env. Bioacc. Pot. (HRS Table 4-15)	Ecotox./Pers./Env. Bioacc. Value (HRS Table 4-21)							
5	1,3-Dichlorobenzene	NL	0.01	--	1	--	50	--	100	100	50	5,000	--		1	50	1		
1,4,5	1,2-Dichlorobenzene	10	0.01	0.1	1	10	50	500	100	100	50	5,000	0.1	5	1	50	1		
1,5	1,4-Dichlorobenzene	10	0.01	0.1	1	10	50	500	100	100	50	5,000	0.1	5	1	50	1		
5	Nitrobenzene	1,000	0.01	10	1	1,000	5	5,000	100	100	5	500	10	50	1	5	1		
5	1,2,4-Trichlorobenzene	1,000	0.01	10	1	1,000	500	500,000	1,000	1,000	500	500,000	10	5,000	10	5,000	1		
1,2,5	Naphthalene	1	0.01	0.01	0.4	0.4	500	200	1,000	400	500	200,000	0.004	2	4	2,000	0.2		
1,2,5	2-Methylnapthalene	NL	1	--	0.4	--	500	--	NL	--	500	--	--	--	--	--	0.2		
4,5	2,4-Dinitrotoluene	1,000	0.01	10	0.4	400	50	20,000	100	40	50	2,000	4	200	0.4	20	0.02		
5	2,6-Dinitrotoluene	1,000	0.01	10	0.07	70	50	3,500	10	1	50	35	0.7	35	0.007	0.35	0.02		
2,5	N-Nitrosodiphenylamine	10	0.01	0.1	1	10	500	5,000	100	100	500	50,000	0.1	50	1	500			
2,5	Phenanthrene	NL	0.0001	--	0.4	--	50	--	1,000	400	5,000	2E+06	--	--	0.04	200			
1,2,4,5	di-n-Butyl phthalate	10	0.01	0.1	1	10	5,000	50,000	1,000	1,000	5,000	5E+06	0.1	500	10	50,000	0.02		
4,5	Fluoranthene	100	0.0001	0.01	1	100	5,000	500,000	10,000	10,000	5,000	5E+07	0.01	50	1	5,000	0.0002		
2,4,5	Pyrene	100	0.0001	0.01	1	100	50	5,000	NL	--	50	--	0.01	0.5	--	--	0.002		
1,2,4,5	bis(2-Ethylhexyl)phthalate	100	0.0001	0.01	1	100	50,000	5E+06	1,000	1,000	50,000	5E+07	0.01	500	0.1	5,000	0.002		
1,3,4,5,6,8,9	Benzene	100	1	100	0.4	40	5,000	200,000	100	40	500	20,000	40	200,000	40	2E+04	1		
3	Trichlorofluoromethane	10	0.01	0.1	1	10	50	500	NL	--	50	--	0.1	5	--	--	1		
6	Dibromochloromethane	100	0.01	1	1	100	50	5,000	NL	--	50	--	1	50	--	--	1		
6	Dibromomethane	10,000	1	10,000	1	10,000	5	50,000	NL	--	50	--	10,000	50,000	--	--	1		
6	1,1,1,2-Tetrachloroethane	100	0.01	1	0.4	40	50	2,000	10	4	50	200	0.4	20	0.04	2			

# SI Table 3: WASTE CHARACTERIZATION WORKSHEETS (Continued)

Pine Swamp

Hamden, Connecticut

CERCLIS ID Number: CTE980521082

SCDM Version: June 1994

Sources:

1. East Burning Grounds

2. Battery Waste Area

3. Anixter Area

References: 1,6,7,27,28,29,30,31,32,33,34,35,36,43

4. Incinerator Ash Area

5. West Burning Grounds

6. Southeast Kettle

7. Trap Sands

8. Groundwater Sampling (April 22, 1993)

9. Groundwater Monitoring (November 1986 through April 1993)

			GROUND WATER PATHWAY		SURFACE WATER PATHWAY										GROUND WATER TO SURFACE WATER					
			OVERLAND/FLOOD MIGRATION																	
S o u r c e	Hazardous Substance	Toxicity	GW	Tox./	Pers.	Tox./Pers.	Bioacc.	Tox./Pers./	Ecotox.	Pers.	Env.	Ecotox./Pers.	Tox./Mob./	Pers./Bioacc.	Ecotox./	Ecotox./	Air			
			Mobility	Mobility		Value	Value	Pot.		Value	Pot.	Env. Bioacc.		Value	Pers. Value	Value		Value	Env. Bioacc.	Gas
			(HRS Table 3-8)	(HRS Table 3-9)	(HRS Tables 4-10 & 4-11)	(HRS Table 4-12)	(HRS Table 4-15)	(HRS Table 4-16)	(HRS Table 4-19)	(HRS Table 4-20)	(HRS Table 4-15)	(HRS Table 4-21)	(HRS Table 4-26)	(HRS Table 4-28)	(HRS Table 4-29)	(HRS Table 4-30)	Mob.			
4,6	1,1,2-Trichloroethane	1,000	0.01	10	1	1,000	50	50,000	10	10	50	500	10	500	0.1	5	1			
6	trans-1,3-Dichloropropylene	10,000	1	10,000	0.4	4,000	5	20,000	1,000	400	5	2,000	4,000	20,000	400	2,000	1			
1,2,4	4-Methyl-2-pentanone	100	1	100	1	100	5	500	1	1	5	5	100	500	1	5	1			
6	Chloromethane	10	1	10	0.07	0.7	5	3.5	1	—	—	—	0.1	3.5	0.07	0.35	1			
2	Anthracene	10	0.0001	0.001	0.4	4	5,000	20,000	10,000	4,000	5,000	2E+07	0.0004	2	0.4	2,000	0.002			
2,5	Phenol	1	1	1	0.4	0.4	5	2	10,000	4,000	5	20,000	0.4	2	4,000	20,000	1			
2	Acenaphthylene	NL	0.01	—	1	—	500	—	NL	—	500	—	—	—	—	—	0.02			
2	Dibenzofuran	NL	0.0001	—	1	—	500	—	100	100	500	50,000	—	—	—	—	0.02			
5	Hexachlorobenzene	1,000	0.0001	0.1	1	1,000	5,000	5E+06	10	10	50,000	500,000	0.1	500	0.001	50	0.002			
4	2,4-Dichlorophenol	1,000	0.01	10	0.4	400	500	200,000	100	40	500	20,000	4	2,000	0.4	200				
2	Fluorene	10	0.01	0.1	0.07	0.7	0.5	0.35	NL	—	1	—	0.007	0.0035	—	—	1			
2,4	Benz(a)anthracene	1,000	0.0001	0.1	1	1,000	50,000	5E+07	10,000	10,000	50,000	5E+06	0.1	5,000	1	50,000	0.0002			
2,4	Chrysene	NL	0.0001	—	1	—	500	—	1,000	1,000	5,000	5E+06	—	—	0.1	500	0.0002			
2	Benzo(k)fluoranthene	NL	0.0001	—	1	—	50,000	—	NL	—	50,000	—	—	—	—	—	0.0002			
2	Indeno(1,2,3-cd)pyrene	NL	0.0001	—	1	—	50,000	—	NL	—	50,000	—	—	—	—	—	NL			
2	Benzo(g,h,i)perylene	NL	0.0001	—	1	—	50,000	—	NL	—	50,000	—	—	—	—	—	NL			



# SI Table 3: WASTE CHARACTERIZATION WORKSHEETS (Continued)

Pine Swamp

Hamden, Connecticut

CERCLIS ID Number: CTD980521082

SCDM Version: June 1994

Sources:

1. East Burning Grounds

2. Battery Waste Area

3. Anixter Area

References: 1,6,7,27,28,29,30,31,32,33,34,35,36,43

4. Incinerator Ash Area

5. West Burning Grounds

6. Southeast Kettle

7. Trap Sands

8. Groundwater Sampling (April 22, 1993)

9. Groundwater Monitoring (November 1986 through April 1993)

S o u r c e	Hazardous Substance	Toxicity	GROUND WATER PATHWAY		SURFACE WATER PATHWAY										GROUND WATER TO SURFACE WATER				Air Gas Mob.
			GW Mobility (HRS Table 3-8)	Tox./Mobility Value (HRS Table 3-9)	OVERLAND/FLOOD MIGRATION										Tox./Mob./Pers./Bioacc. Value (HRS Table 4-26)	Ecotox./Mob./Pers./Bioacc. Value (HRS Table 4-29)	Ecotox./Mob./Pers./Bioacc. Value (HRS Table 4-30)		
					Pers. (HRS Tables 4-10 & 4-11)	Tox./Pers. Value (HRS Table 4-12)	Bioacc. Pot. (HRS Table 4-15)	Tox./Pers./Bioacc. Value (HRS Table 4-16)	Ecotox. (HRS Table 4-19)	Pers. (HRS Table 4-20)	Env. Bioacc. Pot. (HRS Table 4-15)	Ecotox./Pers./Env. Bioacc. Value (HRS Table 4-21)							
2,4	Benzo(b)fluoranthene	10,000	0.0001	1	1	10,000	50,000	5E+08	NL	--	50,000	--	1	50,000	--	--	0.002		
3,5,8,9	PCB	10,000	0.0001	1	1	10,000	50,000	5E+08	10,000	10,000	50,000	5E+08	1	50,000	1	50,000	0.02		
2	4-Methylphenol	100	0.01	1	0.07	7	5	4E+01	100	7	5	35	0.07	0.35	0.07	0	1		
2	Benzo(a)pyrene	10,000	0.0001	1	1	10,000	50,000	5E+08	10,000	10,000	50,000	5E+08	1	50,000	1	50,000	0.0002		
6,9	Carbon Disulfide	1,000	0.01	10	0.4	400	50	20,000	100	40	50	2,000	4	200	0.4	20	1		
2,3,6,9	Methylene Chloride	10	1	10	1	10	5	50	1	1	5	5	10	50	1	5	1		
1,2,3,6,9	Acetone	10	1	10	0.07	0.7	0.5	0.35	100	7	0.5	3.5	0.7	0.35	7	3.5	1		
3,4,6,9	trans-1,2-Dichloroethene	100	1	100	1	100	50	5,000	1	1	50	50	100	5,000	1	50	1		
1,3,9	Carbon Tetrachloride	1,000	0.01	10	1	1,000	50	50,000	100	100	50	5,000	10	500	1	50	1		
2,4,9	2-Butanone	10	1	10	0.4	4	0.5	2	1	0.4	0.5	0.2	4	2	0.4	0.2	1		
9	Bromodichloromethane	100	0.01	1	1	100	50	5,000	NL	--	50	--	1	50	--	--	1		
8,9	Vinyl Chloride	10,000	0.01	100	0.07	700	5	3,500	NL	--	5	--	7	35	--	--	1		
3,6,8,9	1,1-Dichloroethane	10	1	10	1	10	5	50	NL	--	5	--	10	50	--	--	1		
8,9	Total 1,2-Dichloroethene	100	1	100	1	100	50	5,000	1	1	50	50	100	5,000	1	50	1		
1,4,5,6,8,9	1,2-Dichloropropane	1,000	1	1,000	1	1,000	50	50,000	10	10	50	500	1,000	50,000	10	500	1		
1,3,4,5,6,8,9	Trichloroethene	10	0.01	0.1	1	10	50	500	100	100	50	5,000	0.1	5	1	50	1		
1,3,4,5,6,8,9	1,1,1-Trichloroethane	1	0.01	0.01	1	1	5	5	10	10	5	50	0.01	0.05	0.1	0.5	1		
8,9	1,2-Dichloroethane	100	1	100	1	100	5	500	1	1	5	5	100	500	1	5	1		

# SI Table 3: WASTE CHARACTERIZATION WORKSHEETS (Continued)

Pine Swamp

Hamden, Connecticut

CERCLIS ID Number: CTD980521082

SCDM Version: June 1994

Sources:

1. East Burning Grounds

2. Battery Waste Area

3. Anixter Area

References: 1,6,7,27,28,29,30,31,32,33,34,35,36,43

4. Incinerator Ash Area

5. West Burning Grounds

6. Southeast Kettle

7. Trap Sands

8. Groundwater Sampling (April 22, 1993)

9. Groundwater Monitoring (November 1986 through April 1993)

S o u r c e	Hazardous Substance	Toxicity	GROUND WATER PATHWAY		SURFACE WATER PATHWAY										GROUND WATER TO SURFACE WATER					Air Gas Mob.
			GW Mobility (HRS Table 3-8)	Tox./Mobility Value (HRS Table 3-9)	OVERLAND/FLOOD MIGRATION										Tox./Mob./Pers./Bioacc. Value (HRS Table 4-26)	Tox./Mob./Pers./Bioacc. Value (HRS Table 4-28)	Ecotox./Mob./Pers./Bioacc. Value (HRS Table 4-29)	Ecotox./Mob./Pers./Bioacc. Value (HRS Table 4-30)		
					Pers. (HRS Tables 4-10 & 4-11)	Tox./Pers. Value (HRS Table 4-12)	Bioacc. Pot. (HRS Table 4-13)	Tox./Pers./Bioacc. Value (HRS Table 4-16)	Ecotox. (HRS Table 4-19)	Pers. (HRS Table 4-20)	Env. Bioacc. Pot. (HRS Table 4-15)	Ecotox./Pers./Env. Bioacc. Value (HRS Table 4-21)								
1,3,4,5,6,8,9	Tetrachloroethene	100	0.01	1	1	100	50	5,000	100	100	50	5,000	1	50	1	50	1			
1,4,6,8,9	1,1,2,2-Tetrachloroethane	10	0.01	0.1	1	10	5	50	100	100	5	500	0.1	0.5	1	5	1			
1,2,3,4,5,6,8,9	Toluene	10	0.01	0.1	0.4	4	50	200	100	40	50	2,000	0.04	2	0.4	20	1			
1,3,5,6,8,9	Chlorobenzene	100	0.01	1	0.07	7	50	350	1,000	70	50	3,500	0.07	3.5	0.7	35	1			
1,2,3,4,5,6,8,9	Ethylbenzene	10	0.01	0.1	0.4	4	50	200	100	40	50	2,000	0.04	2	0.4	20	1			
1,2,3,4,5,6,8,9	Total Xylenes	10	0.01	0.1	0.4	4	50	200	100	40	50	2,000	0.04	2	0.4	20	1			
1,4,5,6,8,9	Chloroform	100	1	100	1	100	5	500	10	10	5	50	100	500	10	50	1			
3,6,8,9	1,1-Dichloroethene	100	0.01	1	1	100	50	5,000	10	10	50	500	1	50	0.1	5	1			
2,4,5	Manganese	10,000	0.01	100	1	10,000	0.5	5,000	NL	--	50,000	--	100	50	--	--	NL			
1,2,4,5	Aluminum	NL	NL	--	1	--	50	--	NL	--	50	--	--	--	--	--	NL			
2,4,5,6,9	Arsenic	10,000	0.01	100	1	10,000	5	50,000	10	10	50	500	100	500	0.1	5	1			
1,2,4,5,6,7,9	Lead	10,000	0.01	100	1	10,000	50	500,000	1,000	1,000	5,000	5E+06	100	5,000	10	50,000	NL			
1,2,4,5	Mercury	10,000	1	10,000	1	10,000	50,000	5E+08	10,000	10,000	50,000	5E+08	10,000	5E+08	10,000	5.0E+08	0.2			
1,2,5	Zinc	10	0.01	0.1	1	10	500	5,000	10	10	500	5,000	0.1	50	0	50	NL			
2,4,5,9	Cadmium	10,000	1	10,000	1	10,000	5,000	5E+07	1,000	1,000	5,000	5E+06	10,000	5E+07	1,000	5E+06	NL			
5,9	Chromium	10,000	0.01	100	1	10,000	5	50,000	10,000	10,000	5	50,000	100	500	100	500	NL			
2,5	Cobalt	1	0.01	0.01	1	1	0.5	0.5	NL	--	5,000	--	0.01	0.005	--	--	NL			
1,4,5,6,8,9	Barium	10,000	0.01	100	1	10,000	0.5	5,000	1	1	0.5	0.5	100	50	0.01	0.005	NL			
1,5	Magnesium	NL	1	--	1	--	0.5	--	NL	--	0.5	--	--	--	--	--	NL			
1,4	Nickel	100	0.01	1	1	100	0.5	50	10	10	500	5,000	1	0.5	0.1	50	NL			

# SI Table 3: WASTE CHARACTERIZATION WORKSHEETS (Continued)

Pine Swamp

Hamden, Connecticut

CERCLIS ID Number: CTD980521082

SCDM Version: June 1994

Sources:

1. East Burning Grounds

2. Battery Waste Area

3. Anixter Area

References: 1,6,7,27,28,29,30,31,32,33,34,35,36,43

4. Incinerator Ash Area

5. West Burning Grounds

6. Southeast Kettle

7. Trap Sands

8. Groundwater Sampling (April 22, 1993)

9. Groundwater Monitoring (November 1986 through April 1993)

			GROUND WATER PATHWAY		SURFACE WATER PATHWAY										GROUND WATER TO SURFACE WATER					
			OVERLAND/FLOOD MIGRATION																	
S o u r c e	Hazardous Substance	Toxicity	GW	Tox./	Pers.	Tox./Pers.	Bioacc.	Tox./Pers./	Ecotox.	Pers.	Env.	Ecotox./Pers.	Tox./Mob./	Pers./Bioacc.	Ecotox./	Ecotox./	Air			
			Mobility.	Mobility		Value	Value	Pot.		Value	Pers.	Bioacc.		Value	Pers. Value	Value		Value	Env. Bioacc.	Gas
			(HRS Table 3-8)	(HRS Table 3-9)	(HRS Tables 4-10 & 4-11)	(HRS Table 4-12)	(HRS Table 4-15)	(HRS Table 4-16)	(HRS Table 4-19)	(HRS Table 4-20)	(HRS Table 4-15)	(HRS Table 4-21)	(HRS Table 4-26)	(HRS Table 4-28)	(HRS Table 4-29)	(HRS Table 4-30)	Mob.			
1,2,4,5	Vanadium	100	0.01	1	1	100	0.5	50	NL	1	0.5	--	1	0.5	--	--	NL			
1,4	Cyanide	100	NL	--	0.07	7	0.5	3.5	1,000	70	0.5	35	--	--	--	--	NL			
9	Selenium	100	0.01	1	1	100	5,000	500,000	100	100	5,000	500,000	1	5,000	1	5,000	NL			
9	Silver	100	0.01	1	1	100	50	5,000	10,000	10,000	50	500,000	1	50	100	5,000	NL			
2	Dibenz(a,h)anthracene	NL	0.0001	--	1	--	50,000	--	NL	--	50,000	--	--	--	--	--	NL			
2,4	Copper	NL	0.01	--	1	--	50,000	--	100	100	50,000	5E+06	--	--	1	50,000	NL			
2	Beryllium	10,000	0.01	100	1	10,000	50	500,000	NL	--	50	--	100	5,000	--	--	NL			
2	Iron	NL	0.01	--	1	--	0.5	--	10	10	0.5	5	--	--	0.1	--	NL			
2	Benzoic Acid (2)	1	1	1	0.07	0.07	5	0.35	1	0.07	5	0.35	0.07	0.35	0.07	0.35	NL			
2	Acenaphthene	10	0.01	--	1	--	500	--	10,000	--	500	--	--	--	--	--	NL			
2	Dibenzofuran	NL	0.0001	--	1	--	500	--	100	100	500	50,000	--	--	0.01	5	0.02			
2,4,5	Calcium	NL	NL	--	NL	--	NL	--	NL	--	NL	--	--	--	--	--	NL			
4	Chloroform	100	1	100	1	100	5	500	10	10	5	50	100	500	10	50	1			
2,4	Sodium	NL	0.01	--	1	--	0.5	--	NL	--	0.5	--	--	--	--	--	NL			
4	Antimony	10,000	0.01	100	1	10,000	1	5,000	NL	--	0.5	--	100	50	--	--	NL			
4	di-n-Octyl phthalate	100	0.0001	0.01	1	100	500	50,000	--	0	500	0	0.01	5	0	0	0.002			
2	Potassium	NL	NL	--	NL	--	NL	--	NL	--	NL	--	--	--	--	--	NL			
4	Thallium	1,000	0.0001	0.1	1	1,000	500	500,000	NL	--	500	--	0.1	50	--	--	NL			
4	4,4'-DDT	1,000	0.0001	0.1	1	1,000	50,000	5E+07	10,000	10,000	50,000	5E+08	0.1	5,000	1	50,000	0.002			
4	4,4'-DDE	100	0.0001	0.01	1	100	50,000	5E+06	10,000	10,000	50,000	5E+08	0.01	500	1	50,000	0.002			

### SI Table 3: WASTE CHARACTERIZATION WORKSHEETS (Continued)

Pine Swamp

Hamden, Connecticut

CERCLIS ID Number: CTD980521082

SCDM Version: June 1994

Sources:

1. East Burning Grounds

2. Battery Waste Area

3. Anixter Area

References: 1,6,7,27,28,29,30,31,32,33,34,35,36,43

4. Incinerator Ash Area

5. West Burning Grounds

6. Southeast Kettle

7. Trap Sands

8. Groundwater Sampling (April 22, 1993)

9. Groundwater Monitoring (November 1986 through April 1993)

Notes:

NL = Not Listed in Current SCDM.

-- = Unable to Calculate Due to Insufficient Information Available in Current SCDM.

Fluoranthene = Benzo(j,k)fluorene

4-Methyl-2-Pentanone = Methyl isobutyl ketone

2-Butanone = Methyl ethyl ketone

Benzo(b)fluoranthene = 3,4-Benzofluoranthene

4-Methylphenol = p-Cresol

trans-1,3-Dichloropropylene = Dichloropropene

Total Xylenes represented by p-Xylene

Persistence Values are from SCDM "Lake" category

Bioaccumulation and Ecotoxicity values are from SCDM "Freshwater" category

Ground Water Mobility values are from SCDM "Non-liquid, Non-Karst" category

## GROUND WATER PATHWAY

### GROUND WATER USE DESCRIPTION

#### Ground Water Use within 4 Miles of the Site:

The surficial geology in the vicinity of the Pine Swamp site is mapped as ice contact stratified drift. The sediments are comprised of gravel, sand, silt and clay in varying proportions and degree of sorting [39]. The depth to bedrock is 150 to 250 feet [26,28]. Bedrock in the area is New Haven Arkose, which consists of moderately fractured sandstone and conglomerate interbedded with siltstone [30,31].

The Pine Swamp property is in the geographical center of the Pine Swamp Basin, and groundwater in the vicinity of Pine Swamp flows radially inward toward the onsite pond system. Flow through the ponds is north to the outlet at Treadwell Street, which leads to Lake Whitney. Due to the hilly terrain, the depth to groundwater onsite varies from 0 to 35 feet [6,30,32]. The groundwater in the vicinity of Pine Swamp has been classified "GB/GAA" by the Water Compliance Unit of the CTDEP. Groundwater sources with a GB classification may not be suitable for public or private drinking water without treatment due to known or presumed degradation. Groundwater sources with a GAA classification are suitable for public drinking water without treatment. A GB/GAA classification denotes waters for which the state intends to restore to class GAA conditions [5].

There are no public groundwater supply wells located within 4 miles of the property. The North Sleeping Giant, South Sleeping Giant and Mt. Carmel wells are located approximately 5 miles north of the Pine Swamp property. The water supply for the town of Hamden is a blended system consisting of these wellfields and several reservoir systems located outside the 15-mile downstream target distance [12,20]. The estimated total number of groundwater users of wells within 4 miles is 3,309 persons [22]. Estimated drinking water populations served by groundwater sources within four miles of the Pine Swamp property are given in Table 1.

**TABLE 1**

**Estimated Drinking Water Populations  
Served by Groundwater Sources Within 4 Miles of  
Pine Swamp**

Radial Distance from Property (miles)	Estimated Population Served by Private Wells	Estimated Population Served by Public Wells	Total Estimated Population Served by Groundwater Sources
0.00 - 0.25	5	0	5
> 0.25 - 0.50	0	0	0
> 0.50 - 1.00	21	0	21
> 1.00 - 2.00	466	0	466
> 2.00 - 3.00	972	0	972
> 3.00 - 4.00	1,845	0	1,845
<b>TOTAL</b>	<b>3,309</b>	<b>0</b>	<b>3,309</b>

Reference: 8,22

Several private wells, described below, are located in the vicinity of the Pine Swamp property. Only two of the wells, the [REDACTED] Farm well and the Tech Auto well, are used for drinking water. Distances are given from the Putnam Avenue entrance of the Pine Swamp property.

<u>Well Name</u>	<u>Well Description</u>
[REDACTED] Farm	Background drinking water well 0.2 mile south of the Pine Swamp property on Putnam Avenue serving 5 people
Atlantic Film	Industrial well 0.2 mile south of the Pine Swamp property on Putnam Avenue
H.A. Leeds Co.	Industrial well 0.2 mile southeast of the Pine Swamp property on Leeder Hill Drive
Whitney Center	Industrial well 0.4 mile east of the Pine Swamp property on Leeder Hill Drive
Himmel Brothers	Industrial well 0.3 mile north of the Pine Swamp property on Beacon Street/ Dixwell Avenue
Tech Auto Inc.	Drinking water well 1.3 miles northeast of Pine Swamp property on Connolly Parkway serving 20 people

Ground Water Drinking Water Populations for each Aquifer:

County average number of persons per household: 2.55

Town average number of persons per household (Hamden): 2.43

Reference: 11

**SI Table 4: GROUND WATER OBSERVED RELEASE SUBSTANCES (BY AQUIFER)**

Sample ID	Hazardous Substance	Substance Conc. (ug/L)	Background Sample ID	Background Conc.	Toxicity/Mobility	References
MP-3S	1,1-Dichloroethane	7.7	--	--	10	28
MP-3S	Vinyl Chloride	20	--	--	10,000	28
MP-9D	1,2-Dichloropropane	170	--	--	1,000	28
MP-9I	Trichloroethane	170	--	--	10	28
MP-3S	Benzene	15	--	--	100	28
MP-9I	Tetrachloroethene	1100	--	--	100	28
MP-3S	1,1,2,2-Tetrachloroethane	6.6	--	--	10	28
MP-3S	Toluene	65	--	--	10	28
MP-3S	Chlorobenzene	2500	--	--	100	28
MP-3S	Ethylbenzene	17	--	--	10	28
MP-3S	Total Xylenes	28	--	--	10	28
MP-3S	Aroclor-1248	10	--	--	10,000	28
MP-9D	Barium	0.59	--	--	10	28
MP-3I	Chloroform	3.7	--	--	100	28
MP-9I	1,1-Dichloroethene	15	--	--	100	28
MP-9I	1,2-Dichloroethane	13	--	--	100	28
MP-9I	1,1,1-Trichloroethane	30	--	--	1	28
Highest Toxicity/Mobility					10,000	

**Notes:**

No background sample available.

Vinyl chloride not found in source but is a product of trichloroethene and 1,1,2,2-tetrachloroethane biodegradation.

Sample IDs MP-3(S,I) and MP-9(I,D) correspond with annual groundwater monitoring locations GW-03 and GW-09, respectively.

1994 groundwater monitoring results indicated the presence of the compounds listed above as well as methylene chloride (maximum concentration 3.4 ug/l); carbon disulfide (maximum concentration 72 ug/l); 1,1,2-trichloroethene (maximum concentration 2.9 ug/l); and carbon tetrachloride (maximum concentration 2.4 ug/l) [29].



**SI Table 5: GROUND WATER ACTUAL CONTAMINATION TARGETS**

Well ID:		Level I/Level II			Population Served		References	
Sample ID	Hazardous Substance	Conc. (ug/L)	Benchmark Conc. (ug/L) (MCL or MCLG)	% of Benchmark	Cancer Risk Conc. (ug/L)	% of Cancer Risk Conc.	RfD (ug/L)	% of RfD
			Highest Percent		Sum of Percents		Sum of Percents	

Well ID:		Level I/Level II			Population Served		References	
Sample ID	Hazardous Substance	Conc. (ug/L)	Benchmark Conc. (ug/L) (MCL or MCLG)	% of Benchmark	Cancer Risk Conc. (ug/L)	% of Cancer Risk Conc.	RfD (ug/L)	% of RfD
			Highest Percent		Sum of Percents		Sum of Percents	

# GROUND WATER PATHWAY WORKSHEET

## LIKELIHOOD OF RELEASE

		Score	Data Type	Refs
1.	OBSERVED RELEASE: If sampling data or direct observation support a release to the aquifer, assign a score of 550. Record observed release substances on SI Table 4.	550	H	28
2.	POTENTIAL TO RELEASE: Depth to aquifer: <u>0-10</u> feet. If sampling data do not support a release to the aquifer, and the site is in karst terrain or the depth to aquifer is 70 feet or less, assign a score of 500; otherwise, assign a score of 340. Optionally, evaluate potential to release according to HRS Section 3.	--	--	

LR = 550

## TARGETS

		Score	Data Type	Refs
	Are any wells part of a blended system? Yes <u>  </u> No <u>X</u> If yes, attach a page to show apportionment calculations.	--	H	12
3.	ACTUAL CONTAMINATION TARGETS: If analytical evidence indicates that any target drinking water well for the aquifer has been exposed to a hazardous substance from the site, evaluate the factor score for the number of people served (SI Table 5).  Level I: <u>      </u> people x 10 = <u>      </u> Level II: <u>      </u> people x 1 = <u>      </u> Total = <u>      </u>	0*	E	15,16, 27,30
4.	POTENTIAL CONTAMINATION TARGETS: Determine the number of people served by drinking water wells for the aquifer or overlying aquifers that are not exposed to a hazardous substance from the site; record the population for each distance category in SI Table 6a or 6b. Sum the population values and multiply by 0.1.	30.2	E	15
5.	NEAREST WELL: Assign a score of 50 for any Level I Actual Contamination Targets for the aquifer or overlying aquifer. Assign a score of 45 if there are Level II targets but no Level I targets. If no Actual Contamination Targets exist, assign the Nearest Well Score from SI Table 6a or 6b. If no drinking water wells exist within 4 miles, assign 0.	20	E	22
6.	WELLHEAD PROTECTION AREA (WHPA): If any source lies within or above a WHPA for the aquifer, or if a ground water observed release has occurred within a WHPA, assign a score of 20; assign 5 if neither condition applies but a WHPA is within 4 miles; otherwise assign 0.	0	H	22
7.	RESOURCES: Assign a score of 5 if one or more ground water resource applies; assign 0 if none applies: <ul style="list-style-type: none"> <li>• Irrigation (5 acre minimum) of commercial food crops or commercial forage crops</li> <li>• Watering or commercial livestock</li> <li>• Ingredient in commercial food preparation</li> <li>• Supply for commercial aquaculture</li> <li>• Supply for a major or designated water recreation area, excluding drinking water use</li> </ul>	5	E	44,45, 46,47
Sum of Targets T =		50.2		

Notes: 1993 onsite groundwater monitoring showed an observed release to the aquifer downgradient of several source areas (see Table 4) [28].

\*The Dadio well, located 0.2 miles south and upgradient of the Pine Swamp property on the bank of Lake Whitney, is used for drinking water for approximately 5 people [8]. The [redacted] well was sampled by CDM on August 23, 1994. Results of the sampling showed the presence of one VOC (chloroform) and several inorganic analytes at concentrations well below Maximum Contaminant Levels (MCLs). Because the [redacted] well is upgradient of the Pine Swamp source areas and concentrations of compounds and analytes detected in the groundwater sample collected at the well are low, the [redacted] well is not included as a target [34,36].

The Tech Auto well, located 1.3 miles northeast of the Pine Swamp property on the bank of Lake Whitney, is used for drinking water for approximately 20 employees [16]. The Tech Auto well was sampled by NUS Corporation on May 16, 1984. Results of the sampling showed no detectable volatile organic compounds, semi-volatile organic compounds or inorganic elements, with the exception of 14 parts per billion of manganese [31]. Because the Tech Auto well is not in the same drainage basin and is 1.3 miles away, the well is assumed to be unaffected by groundwater contamination originating on the Pine Swamp property [46].

**SI TABLE 6 (From HRS TABLE 3-12): VALUES FOR POTENTIAL CONTAMINATION GROUND WATER  
TARGET POPULATIONS**

**SI Table 6a: Other Than Karst Aquifers**

Distance From Site	Pop.	Nearest Well (choose highest)	Population Served by Wells within Distance Category												Pop. Value	Ref.	
			1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	100,001 to 300,000	300,001 to 1,000,000	1,000,000 to 3,000,000			
0 to 1/4 mile	5	20	4	17	53	164	522	1,633	5,214	16,325	52,137	163,246	521,360	1,632,455	4	8,22	
> 1/4 to 1/2 mile	0	18	2	11	33	102	324	1,013	3,233	10,122	32,325	101,213	323,243	1,012,122	0	22	
> 1/2 to 1 mile	21	9	1	5	17	52	167	523	1,669	5,224	16,684	52,239	166,835	522,385	5	22	
> 1 to 2 miles	466	5	0.7	3	10	30	94	294	939	2,939	9,385	29,384	93,845	293,842	94	22	
> 2 to 3 miles	972	3	0.5	2	7	21	68	212	678	2,122	6,778	21,222	67,777	212,219	68	22	
> 3 to 4 miles	1845	2	0.3	1	4	13	42	131	417	1,306	4,171	13,060	41,709	130,596	131	22	
Nearest Well =		20													Sum =		302

Notes:

# GROUND WATER PATHWAY WORKSHEET (concluded)

## WASTE CHARACTERISTICS

WASTE CHARACTERISTICS		Score	Data Type	Does Not Apply																						
8.	If any Actual Contamination Targets exist for the aquifer or overlying aquifers, assign the calculated hazardous waste quantity score or a score of 100, whichever is greater; if no Actual Contamination Targets exist, assign the hazardous waste quantity score calculated for sources available to migrate to ground water.	10	H	33.33																						
9.	Assign the highest ground water toxicity/mobility value from SI Table 3 or 4.  Substance(s): <u>PCB</u> <u>Vinyl Chloride</u> <u>See Notes</u>  From Table: <u>SI Table 4</u> <u>SI Table 4</u> <u>SI Table 3</u>	10,000	H	28																						
10.	Multiply the ground water toxicity/mobility and hazardous waste quantity scores. Assign the Waste Characteristics score from the table below: (from HRS Table 2-7)  <table><tr><th>PRODUCT</th><th>WC Score</th></tr><tr><td>0</td><td>0</td></tr><tr><td>&gt;0 to &lt;10</td><td>1</td></tr><tr><td>10 to &lt;100</td><td>2</td></tr><tr><td>100 to &lt;1,000</td><td>3</td></tr><tr><td>1,000 to &lt;10,000</td><td>6</td></tr><tr><td>10,000 to &lt;1E + 05</td><td>10</td></tr><tr><td>1E + 05 to &lt;1E + 06</td><td>18</td></tr><tr><td>1E + 06 to &lt;1E + 07</td><td>32</td></tr><tr><td>1E + 07 to &lt;1E + 08</td><td>56</td></tr><tr><td>1E + 08 or greater</td><td>100</td></tr></table>	PRODUCT	WC Score	0	0	>0 to <10	1	10 to <100	2	100 to <1,000	3	1,000 to <10,000	6	10,000 to <1E + 05	10	1E + 05 to <1E + 06	18	1E + 06 to <1E + 07	32	1E + 07 to <1E + 08	56	1E + 08 or greater	100	18		
PRODUCT	WC Score																									
0	0																									
>0 to <10	1																									
10 to <100	2																									
100 to <1,000	3																									
1,000 to <10,000	6																									
10,000 to <1E + 05	10																									
1E + 05 to <1E + 06	18																									
1E + 06 to <1E + 07	32																									
1E + 07 to <1E + 08	56																									
1E + 08 or greater	100																									
WC =		18																								

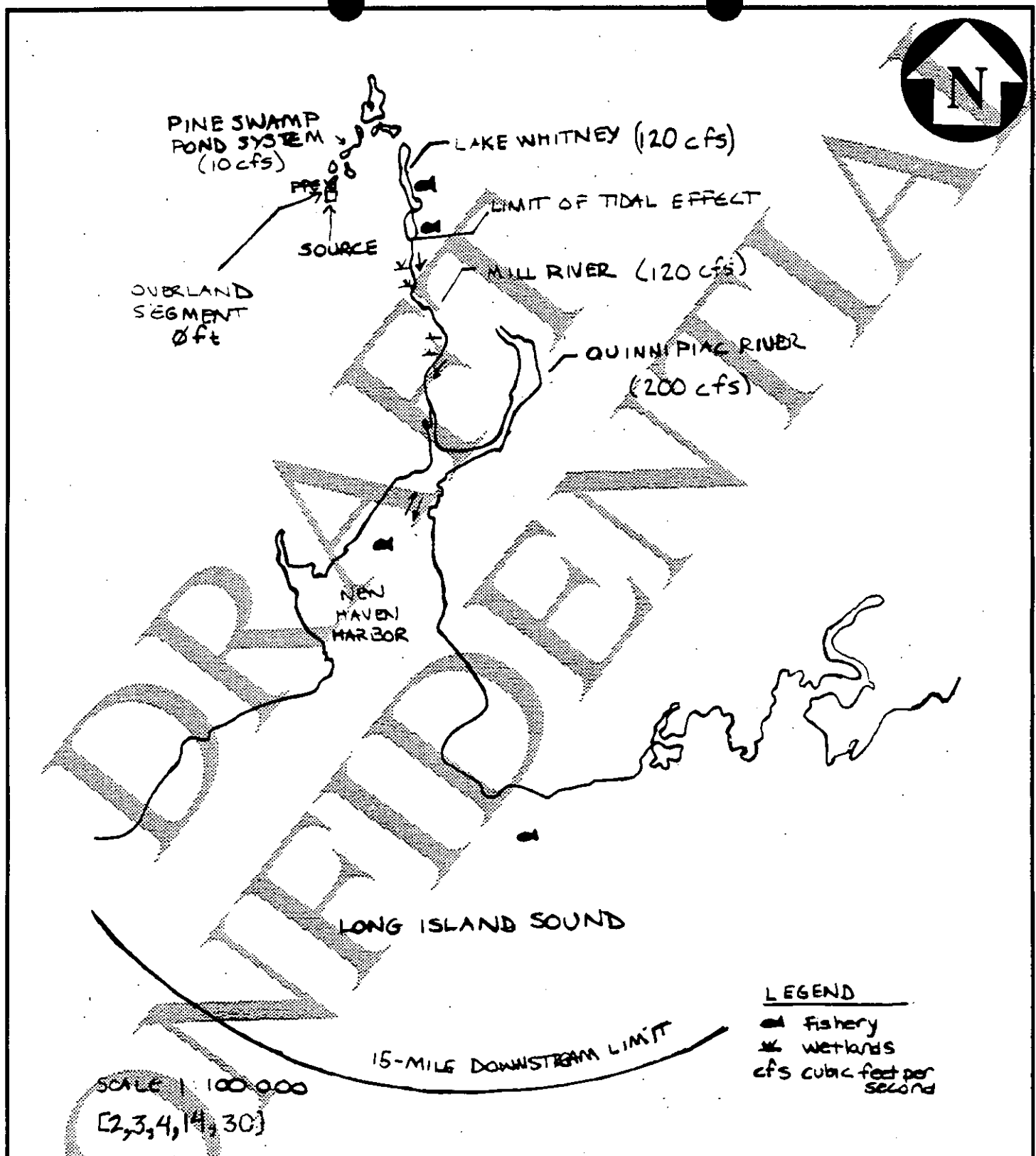
Multiply LR by T and by WC. Divide the product by 82,500 to obtain the ground water pathway score for each aquifer. Select the highest aquifer score. If the pathway score is greater than 100, assign 100.

GROUND WATER PATHWAY SCORE:  $\frac{550 \times 50.2 \times 18}{82,500}$  =

6.02

Maximum of (100)

Notes: The following substances, which were detected in the 1993 groundwater sampling and the 1986 through 1988 source area soil sampling, have a toxicity/mobility value of 10,000: dibromomethane, trans-1,3-dichloropropylene, benzo(b)fluoranthene, benzo(a)pyrene, mercury, arsenic, lead, manganese, cadmium, chromium, and barium [28,30].



**SURFACE WATER PATHWAY**  
**PINE SWAMP**  
**HAMDEN, CONNECTICUT**

CDM FEDERAL PROGRAMS CORPORATION  
 a subsidiary of Camp Dresser & McKee Inc.

Figure 4

**SI Table 7: SURFACE WATER OBSERVED RELEASE SUBSTANCES**

Sample ID	Hazardous Substance	Substance Conc. (mg/kg)	Background Sample ID	Background Conc.	Toxicity/ Persistence	Tox./Pers./ Bioacc.	Ecotox./Pers./ Ecobioacc.	References
SD-03	Di-n-butylphthalate	0.57	SD-10	0.40 U	10	50,000	5E+06	34,36,43
SD-03	4,4'-DDE	0.013	SD-10	0.0041 U	100	5E+06	5E+08	34,36,43
SD-03	Calcium	10,100	SD-10	1,590	NL	NL	NL	34,36,43
SD-06	alpha Chlordane	0.027	SD-10	0.0084 J	NL	NL	NL	34,36,43
SD-08	Acetone	0.45 J	SD-10	0.012 UJ	0.7	0.35	3.5	34,36,43
SD-08	Acenaphthylene	2.2 J	SD-10	0.036 J	--	--	--	34,36,43
SD-08	Fluorene	0.91 J	SD-10	0.270 J	0.7	0.35	--	34,36,43
SD-08	Anthracene	0.93 J	SD-10	0.310 J	10	4	2E+07	34,36,43
SD-08	Pyrene	18 J	SD-10	3 J	100	5,000	--	34,36,43
SD-08	Fluoranthene	42 J	SD-10	5.90	100	5E+05	5E+07	34,36,43
SD-08	Benzo(a)anthracene	15 J	SD-10	2.1 J	1,000	5E+07	50,000	34,36,43
SD-08	Chrysene	19 J	SD-10	1.4 J	--	--	5E+06	34,36,43
SD-08	Benzo(b)fluoranthene	44 J	SD-10	2.60	1	5E+08	--	34,36,43
SD-08	Benzo(k)fluoranthene	11 J	SD-10	0.82	--	--	--	34,36,43
SD-08	Benzo(a)pyrene	18 J	SD-10	1.40	10,000	5E+08	5E+08	34,36,43
SD-08	Indeno(1,2,3-cd)pyrene	7.2 J	SD-10	0.50	--	--	--	34,36,43
SD-08	Dibenzo(a,h)anthracene	1.3 J	SD-10	0.076	--	--	--	34,36,43
SD-06	Benzo(g,h,i)perylene	5.7 J	SD-10	0.37	--	--	--	34,36,43
SD-08	Aluminum	37,700 J	SD-10	3,970.00	--	--	--	34,36,43
SD-08	Arsenic	19.1 J	SD-10	65 U	10,000	50,000	500	34,36,43
SD-08	Barium	276 J	SD-10	41.2 U	10,000	10,000	0.5	34,36,43
SD-08	Beryllium	1.2 J	SD-10	0.08 J	10,000	5E+05	--	34,36,43
SD-08	Cadmium	10.6 J	SD-10	0.84 UJ	10,000	5E+07	5E+06	34,36,43
SD-08	Chromium	128 J	SD-10	14.2 J	10,000	50,000	50,000	34,36,43
SD-08	Cobalt	18.4 J	SD-10	2.70	1	0.5	--	34,36,43
SD-08	Copper	396 J	SD-10	25.50	--	--	5E+06	34,36,43
SD-08	Iron	35,500 J	SD-10	8,940.00	--	--	5	34,36,43
SD-08	Lead	817 J	SD-10	67.9 J	10,000	5E+05	5E+06	34,36,43
SD-08	Magnesium	7,120 J	SD-10	1,380.00	--	--	--	34,36,43
SD-08	Manganese	751 J	SD-10	73.20	10,000	5,000	50,000	34,36,43
SD-08	Mercury	1.4 J	SD-10	0.05 U	10,000	5E+08	5E+08	34,36,43
SD-08	Nickel	57.9 J	SD-10	8.1 U	100	50	5,000	34,36,43
SD-08	Potassium	3,460 J	SD-10	368 UJ	NL	NL	NL	34,36,43
SD-08	Selenium	3.3 J	SD-10	0.18 U	100	5E+05	5E+05	34,36,43
SD-08	Silver	2.5 J	SD-10	0.76 U	100	5,000	5E+05	34,36,43
SD-08	Sodium	800 J	SD-10	234 U	--	--	--	34,36,43
SD-08	Vanadium	92.1 J	SD-10	18.9	100	50	--	34,36,43
SD-08	Zinc	3,490 J	SD-10	74.4	10	5,000	5,000	34,36,43
SD-08	Chlorobenzene	0.048	SD-10	0.012 U	7	350	3,500	34,36,43
SD-08	4,4'-DDT	0.073	SD-10	0.004 U	1,000	5E+07	5E+08	34,36,43
SD-07	Mercury	0.19	SD-10	0.05 U	10,000	5E+08	5E+08	34,36,43
				Highest Values	10,000	5E+08	5E+08	

**Notes:**

Background sample is SD-10 collected by CDM on August 23, 1994 from the urban drainage stream into Pond A.

NA = Not Available

NL = Not Listed in Current SCDM.

-- = Unable to Calculate Due to Insufficient Information Available in Current SCDM.

**SI Table 8: SURFACE WATER DRINKING WATER CONTAMINATION TARGETS**

Intake ID	Sample Type:	Level I/Level II			Population Served		References	
Sample ID	Hazardous Substance	Conc. (ug/L)	Benchmark Conc. (ug/L) (MCL or MCLG)	% of Benchmark	Cancer Risk Conc. (ug/L)	% of Cancer Risk Conc.	RfD (ug/L)	% of RfD
Highest Percent					Sum of Percents		Sum of Percents	

**NOTE:** Values are listed in mg/L in SCDM.

Intake ID	Sample Type:	Level I/Level II			Population Served		References	
Sample ID	Hazardous Substance	Conc. (ug/L)	Benchmark Conc. (ug/L) (MCL or MCLG)	% of Benchmark	Cancer Risk Conc. (ug/L)	% of Cancer Risk Conc.	RfD (ug/L)	% of RfD
Highest Percent					Sum of Percents		Sum of Percents	

Runoff from the Pine Swamp property flows radially inward to the onsite ponds. Ponds A and B also receive urban runoff discharge from a stream at Putnam Avenue and a storm sewer at the east end of Oregon Avenue, respectively. The onsite ponds have been classified B/AA, which indicates that the water quality is threatened by a potential source of pollution. The goal of the state is to restore waters with a B/AA classification to Class AA conditions [21]. The probable point of entry for surface water from the Pine Swamp source areas is 0 feet to Pond A [3]. Source areas adjacent to the onsite ponds may be located inside the 100-year flood plain [40].

The onsite ponds flow north from Pond A to Pond E through a culvert under Treadwell Street into Lake Whitney, a former drinking water supply formed by a dam on the Mill River. Use of Lake Whitney for drinking water was discontinued in August 1991 due to a decrease in demand. Because the South Central Connecticut Regional Water Authority (SCCRWA) has no plans to use Lake Whitney in the near future and the SCCRWA would require approximately 6 months to upgrade the current treatment facility at Lake Whitney before bringing the facility back on line, the intake does not qualify as a standby intake [12,17].

The SCCRWA performs routine monitoring for VOCs at the point where the Pine Swamp ponds flow into Lake Whitney. VOCs were detected in one of the four samples collected during the period of May 1993 to June 1994, including 1,1,1-trichloroethane (0.7 ug/l), cis-1,2-dichloroethene (0.7 ug/l), perchloroethene (1.1 ug/l), and trichloroethene (0.9 ug/l). No VOCs were detected in the remaining three samples. The SCCRWA also collects samples at the Lake Whitney intake structure. VOCs were detected in one of the four samples collected during the period of May 1993 through June 1994, including cis-1,2-dichloroethene (0.6 ug/l) and trichloroethene (0.6 ug/l). No VOCs were detected in the remaining three samples. The VOCs detected in the surface water samples were also detected in Pine Swamp source soil samples [18,30].

Onsite pond fish species include blue gill sunfish and pumpkinseed sunfish [30]. Lake Whitney fish species include large mouth bass, blue gill sunfish, pumpkin seed sunfish, yellow perch, carp, white suckers, brown bullhead, golden shiner and black crappy [9]. The presence of fishing line found near the culverts between the ponds indicates that people fishing in the onsite ponds [3].

Lake Whitney flows into the Mill River, which flows into New Haven Harbor and Long Island Sound [46]. Mill River fish species include black crappy, white sucker, brown bullhead, American eel, mummichug and silverside [9]. Sixty-seven finfish and squid species were identified by the CTDEP as species that may be found in New Haven Harbor [4]. Eighty species of finfish and 22 species of invertebrates were caught and identified in Long Island Sound from 1984 to 1992 [4]. Sensitive environments within 15 miles downstream of the Pine Swamp property include wetlands on the Pine Swamp property, the Mill River and the New Haven Harbor, which is designated as a critical spawning area for the maintenance of winter flounder (*Pleuronectes americanus*) [4,46].



On August 23, 1994, CDM personnel collected 10 sediment samples from the onsite ponds and urban drainage inlet streams. Results of the CDM sediment sampling indicated the presence of VOCs, SVOCs, pesticides, and inorganic analytes at greater than three times the reference concentration [34,36]. Five of the sediment samples were collected from the downstream side of the culverts between the ponds where fishing line was found in the water and sediments [3].

The highest concentration of the compounds and analytes were detected in sample SD-08, which was collected immediately downgradient of the Battery Waste Area at the edge of Pond A. Based on the 1988 RIS source area delineation, sample SD-08 could have been collected within the source area. Therefore, SD-08 characterizes contamination in the sediment at the Battery Waste Area, but may not document migration of contamination to a target fishery location [34, 36].

# SURFACE WATER PATHWAY LIKELIHOOD OF RELEASE AND DRINKING WATER THREAT WORKSHEET

## LIKELIHOOD OF RELEASE - OVERLAND/FLOOD MIGRATION

	Score	Data Type	Refs
1. <b>OBSERVED RELEASE:</b> If sampling data or direct observation support a release to surface water in the watershed, assign a score of 550. Record observed release substances on SI Table 7.	550	E	30,33 35
2. <b>POTENTIAL TO RELEASE:</b> Distance to surface water: <u>0</u> feet If sampling data do not support a release to surface water in the watershed, use the table below to assign a score from the table below based on distance to surface water and flood frequency.		H	3,30

Distance to surface water < 2500 feet	500
Distance to surface water > 2500 feet, and:	
Site in annual or 10-yr floodplain	500
Site in 100-yr floodplain	400
Site in 500-yr floodplain	300
Site outside 500-yr floodplain	100

Optionally, evaluate surface water potential to release according to HRS Section 4.1.2.1.2

**LR =** 550

## LIKELIHOOD OF RELEASE - GROUND WATER TO SURFACE WATER MIGRATION

	Score	Data Type	Refs
1. <b>OBSERVED RELEASE:</b> If sampling data or direct observation support a release to surface water in the watershed, assign a score of 550. Record observed release substances on SI Table 7.			
<b>NOTE:</b> Evaluate groundwater to surface water migration only for a surface water body that meets all of the following conditions:			
1) A portion of the surface water is within 1 mile of site sources having a containment factor greater than 0.	yes	H	
2) No aquifer discontinuity is established between the source and the above portion of the surface water body.	yes	H	
3) The top of the uppermost aquifer is at or above the bottom of the surface water.	yes	H	3,46
Elevation of top of uppermost aquifer: <u>40 feet</u>			
Elevation of bottom of surface water body: <u>34 feet</u>			
2. <b>POTENTIAL TO RELEASE:</b> Use the groundwater potential to release. Optionally, evaluate surface water potential to release according to HRS Section 3.1.2	500	--	—

**LR =** 500

Notes: The top of the uppermost aquifer is equal to the elevation of the surface water at 40 feet. The ponds on the Pine Swamp property are a maximum of 6 feet deep.

# SURFACE WATER PATHWAY LIKELIHOOD OF RELEASE AND DRINKING WATER THREAT WORKSHEET (CONTINUED)

## DRINKING WATER THREAT TARGETS

	Score	Data Type	Refs																				
<p>Record the water body type, flow, and number of people served by each drinking water intake within the distance limit in the watershed. If there is no drinking water intake within the target distance limit, assign 0 to factors 3, 4, and 5.</p> <table border="1" style="margin: 10px auto; width: 80%; border-collapse: collapse;"> <thead> <tr> <th>Intake Name</th> <th>Water Body Type</th> <th>Flow</th> <th>People Served</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> <p>Are any intakes part of a blended system? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>             If yes, attach a page to show appointment calculations.</p> <p>3. <b>ACTUAL CONTAMINATION TARGETS:</b> If analytical evidence indicates a drinking water intake has been exposed to a hazardous substance from the site, list the intake name and evaluate the factor score for the drinking water population (SI Table 8).</p> <p>_____, _____</p> <p>Level I: _____ people <math>\times</math> 10 = _____            Level II: _____ people <math>\times</math> 1 = _____      <b>Total =</b> _____</p>	Intake Name	Water Body Type	Flow	People Served																	0	H	12
Intake Name	Water Body Type	Flow	People Served																				
<p>4. <b>POTENTIAL CONTAMINATION TARGETS:</b> Determine the number of people served by drinking water intakes for the watershed that have not been exposed to a hazardous substance from the site. Assign the population values from SI Table 9. Sum the values and multiply by 0.1.</p>	0	H	12																				
<p>5. <b>NEAREST INTAKE:</b> Assign a score of 50 for any Level I Actual Contamination Drinking Water Targets for the watershed. Assign a score of 45 if there are Level II targets for the watershed, but no Level I targets. If no Actual Contamination Drinking Water Targets exist, assign a score for the intake nearest the PPE from SI Table 9. If no drinking water intakes exist, assign 0.</p>	0	H	12																				
<p>6. <b>RESOURCES:</b> Assign a score of 5 if one or more surface water resource applies; assign 0 if none applies.</p> <ul style="list-style-type: none"> <li>• Irrigation (5 acre minimum) of commercial food crops or commercial forage crops</li> <li>• Watering of commercial livestock</li> <li>• Ingredient in commercial food preparation</li> <li>• Major or designated water recreation area, excluding drinking water use.</li> </ul>	5	E	44,45, 46,47																				
<b>SUM OF TARGETS T =</b>	5																						

Notes:

**SI TABLE 9 (From HRS Table 4-14): DILUTION-WEIGHTED POPULATION VALUES FOR POTENTIAL CONTAMINATION FOR SURFACE WATER MIGRATION PATHWAY**

Type of Surface Water Body	Pop.	Nearest Intake	Number of people									Pop. Value
			0	1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	
Minimal Stream (<10 cfs)	0	20	(0)	4	17	53	164	522	1,633	5,214	16,325	0
Small to moderate stream (10 to 100 cfs)	0	2	(0)	0.4	2	5	16	52	163	521	1,633	0
Moderate to large stream (> 100 to 1,000 cfs)	0	0	(0)	0.04	0.2	0.5	2	5	16	52	163	0
Large Stream to river (> 1,000 to 10,000 cfs)	0	0	(0)	0.004	0.02	0.05	0.2	0.5	2	5	16	0
Large River (> 10,000 to 100,000 cfs)	0	0	(0)	0	0.002	0.005	0.02	0.05	0.2	0.5	2	0
Very Large River (> 100,000 cfs)	0	0	(0)	0	0	0.001	0.002	0.005	0.02	0.05	0.2	0
Shallow ocean zone or Great Lake (depth < 20 feet)	0	0	(0)	0	0.002	0.005	0.02	0.05	0.2	0.5	2	0
Moderate ocean zone or Great Lake (Depth 20 to 200 feet)	0	0	(0)	0	0	0.001	0.002	0.005	0.02	0.05	0.2	0
Deep ocean zone or Great Lake (depth > 200 feet)	0	0	(0)	0	0	0	0.001	0.003	0.008	0.03	0.08	0
3-mile mixing zone in quiet flowing river (≥ 10 cfs)	0	10	(0)	2	9	26	82	261	817	2,607	8,163	0
Nearest Intake =		0										0
Sum =												0

References: 12  
Notes:

# SURFACE WATER PATHWAY (continued) HUMAN FOOD CHAIN THREAT WORKSHEET

HUMAN FOOD CHAIN THREAT TARGETS	Score	Data Type	Refs
Record the water body type and flow for each fishery within the target distance limit. If there is no fishery within the target distance limit, assign a score of 0 at the bottom of this page.			
Fishery Name/Water Body: Kettle Ponds A-E      Flow: Unknown Species: Sunfish      Production: Unknown      lbs/yr		H	3,30
Fishery Name/Water Body: Lake Whitney      Flow: 89      cfs Species: (see Notes)      Production: Unknown      lbs/yr		H	9
Fishery Name/Water Body: Mill River      Flow: 120      cfs Species: (see Notes)      Production: Unknown      lbs/yr		H	9
Fishery Name/Water Body: New Haven Harbor      Flow: Tidal Species: Flounder      Production: Unknown      lbs/yr		H	19
<b>FOOD CHAIN INDIVIDUAL</b>			
<b>7. ACTUAL CONTAMINATION FISHERIES:</b>  If analytical evidence indicates that a fishery has been exposed to a hazardous substance with a bioaccumulation factor greater than or equal to 500 (SI Table 10), assign a score of 50 if there is a Level I fishery. Assign 45 if there is a Level II fishery, but no Level I fishery. Substance(s): See Final Comments			
<b>8. POTENTIAL CONTAMINATION FISHERIES:</b>  If there is a release of a substance with a bioaccumulation factor greater than or equal to 500 to a watershed containing fisheries within the target distance limit, but there are no Level I or Level II fisheries, assign a score of 20. Substance(s):  If there is no observed release to the watershed, assign a value for potential contamination fisheries from the table below using the lowest flow at all fisheries within the target distance limit:			
Lowest Flow	FCI Value		
< 10 cfs	20		
10 to 100 cfs	2		
> 100 cfs, coastal tidal waters, oceans, or Great Lakes	0		
3-mile mixing zone in quiet flowing river	10		
<b>FCI Value =</b>			
	45	E	27,34,36
<b>SUM OF TARGETS T =</b>			
	45		9,14

Notes: Lake Whitney fish species include large mouth bass, blue gill sunfish, pumpkin seed sunfish, yellow perch, carp, white suckers, brown bullhead, golden shiner and black crappie. Mill River fish species include black crappie, white sucker, brown bullhead, american eel, mummychug and silverside.

**SI Table 10: HUMAN FOOD CHAIN ACTUAL CONTAMINATION TARGETS FOR WATERSHED**

Fishery ID: Pine Swamp Ponds

Sample Type: Sediment

Level II

References 34,36

Sample ID	Hazardous Substance	Substance Concentration (mg/kg)	Benchmark Conc. (mg/kg) (FDAAL)	% of Benchmark	Cancer Risk Conc. (mg/kg)	% of Cancer Risk Conc.	RfD (mg/kg)	% of RfD
SD-03	Di-n-butylphthalate	0.57	NC		NC		NC	
SD-03	4,4'-DDE	0.013	NC		NC		NC	
SD-08	Acenaphthylene	2.2 J	NC		NC		NC	
SD-08	Anthracene	0.93 J	NC		NC		NC	
SD-08	Fluoranthene	42 J	NC		NC		NC	
SD-08	Benzo(a)anthracene	15 J	NC		NC		NC	
SD-08	Chrysene	19 J	NC		NC		NC	
SD-08	Benzo(b)fluoranthene	44 J	NC		NC		NC	
SD-08	Benzo(k)fluoranthene	11 J	NC		NC		NC	
SD-08	Benzo(a)pyrene	18 J	NC		NC		NC	
SD-08	Indeno(1,2,3-cd)pyrene	7.2 J	NC		NC		NC	
SD-08	Dibenzo(a,h)anthracene	1.5 J	NC		NC		NC	
SD-08	Benzo(g,h,i)perylene	5.7 J	NC		NC		NC	
SD-08	Cadmium	10.6 J	NC		NC		NC	
SD-08	Copper	396 J	NC		NC		NC	
SD-08	Mercury	1.4 J	NC		NC		NC	
SD-08	Selenium	3.3 J	NC		NC		NC	
SD-08	Zinc	3,490 J	NC		NC		NC	
SD-09	4,4'-DDT	0.073	NC		NC		NC	
SD-07	Mercury	0.19	NC		NC		NC	
				Highest Percent	Sum of Percents		Sum of Percents	

Notes: Sediment sampling performed by CDM on August 23, 1994.

NL = Not Listed in Current SCDM.

NC = Not Comparable to SCDM; Sediment samples not comparable to SCDM benchmarks for fish tissue.

SCDM Version: June 1994

Reference Sample: SD-10 (urban drainage influent stream to Pond A)

**SI Table 11: SENSITIVE ENVIRONMENT ACTUAL CONTAMINATION TARGETS FOR WATERSHED**

[illegible]

**Highest Percent**

[illegible]

Highest Percent

# SURFACE WATER PATHWAY (continued) ENVIRONMENTAL THREAT WORKSHEET

When measuring length of wetlands that are located on both sides of a surface water body, sum both frontage lengths. For a sensitive environment that is more than one type, assign a value for each type.

## ENVIRONMENTAL THREAT TARGETS

					Score	Data Type	Refs
Record the water body type and flow for each surface water sensitive environment within the target distance (see SI Table 12). If there is no sensitive environment within the target distance limit, assign a score of 0 at the bottom of the page.							
Environment Name	Water Body Type	Flow					
Wetlands	Onsite - Pine Swamp	unknown					
Wetlands	Mill River	120 cfs					
Wetlands	Mill River	120 cfs					
Spawning Area	New Haven Harbor	tidal					
Clean Water Act (CWA) Protection	Pine Swamp Pond System	unknown					
<p>9. <b>ACTUAL CONTAMINATION SENSITIVE ENVIRONMENTS:</b> If sampling data or direct observation indicate any sensitive environment has been exposed to a hazardous substance from the site, record this information on SI Table 11, and assign a factor value for the environment (SI Tables 13 and 14).</p> <p>Substance(s): <u>(See Notes)</u></p> <p>From Table: <u>SI Table 3</u></p>							
Environment Name	Environment Type and Value (SI Tables 13 & 14)	Multipher (10 for Level I, 1 for Level II)	Product				
Onsite wetlands	0 (wetlands < 0.1 mi)	x 10	=	0			
Pine Swamp Ponds	5 (CWA protection)	x 1	=	5			
		x	=				21,
		x	=				34,
<b>Sum =</b>					5	H	36
10. <b>POTENTIAL CONTAMINATION SENSITIVE ENVIRONMENTS:</b>							
Flow	Dilution Weight (SI Table 12)	Environment Type and Value (SI Tables 13 & 14)	Pot. Cont.	Product			
120 cfs	0.01 (Mill River)	x 25 (Wetlands-3150')	x 0.1 =	0.025		H	46
tidal	0.0001 (Harbor)	x 75 (Spawning Areas)	x 0.1 =	0.00075		H	19
		x	x 0.1 =				
		x	x 0.1 =				
		x	x 0.1 =				
<b>Sum =</b>					0.03		
<b>T =</b>					5.03		

Notes: Based on the results of the 1994 SIP sediment sampling performed by CDM, actual contamination is assumed in the onsite wetlands. However, the total length of the onsite wetlands is less than 0.1 mile [34,36,46].



**SI TABLE 12 (HRS Table 4-13):  
SURFACE WATER DILUTION WEIGHTS**

*	Type of Surface Water Body		Assigned Dilution Weight
	Descriptor	Flow Characteristics	
	Minimal stream	< 10 cfs	1
	Small to moderate stream	10 to 100 cfs	0.1
✓	Moderate to large stream	> 100 to 1,000 cfs	0.01
	Large stream to river	> 1,000 to 10,000 cfs	0.001
	Large river	> 10,000 to 100,000 cfs	0.0001
	Very large river	> 100,000 cfs	0.00001
✓	Coastal tidal waters	Flow not applicable; depth not applicable	0.0001
	Shallow ocean zone or Great Lake	Flow not applicable; depth less than 20 feet	0.0001
	Moderate depth ocean zone or Great Lake	Flow not applicable; depth 20 to 200 feet	0.00001
	Deep ocean zone or Great Lake	Flow not applicable; depth greater than 200 feet	0.000005
	3-mile mixing zone in quiet flowing river	10 cfs or greater	0.5

\* Check (✓) appropriate dilution weight.

Notes:

# SI TABLE 13 (HRS TABLE 4-23): SURFACE WATER AND AIR SENSITIVE ENVIRONMENTS VALUES

*	SENSITIVE ENVIRONMENT	ASSIGNED VALUE
	Critical habitat for Federal designated endangered or threatened species Marine Sanctuary National Park Designated Federal Wilderness Area Ecologically important areas identified under the Coastal Zone Wilderness Act Sensitive Areas identified under the National Estuary Program or Near Coastal Water Program of the Clean Water Act Critical Areas identified under the Clean Lakes Program of the Clean Water Act (subareas in lakes or entire small lakes) National Monument (air pathway only) National Seashore Recreation Area National Lakeshore Recreation Area	100
✓	Habitat known to be used by Federal designated or proposed endangered or threatened species National Preserve National or State Wildlife Refuge Unit of Coastal Barrier Resources System Coastal Barrier (undeveloped) Federal land designated for the protection of natural ecosystems Administratively Proposed Federal Wilderness Area Spawning areas critical for the maintenance of fish/shellfish species within a river system, bay, or estuary Migratory pathways and feeding areas critical for the maintenance of anadromous fish species within river reaches or areas in lakes or coastal tidal waters in which the fish spend extended periods of time Terrestrial areas utilized by large or dense aggregations of vertebrate animals (semi-aquatic foragers) for breeding National river reach designated as recreational	75
	Habitat known to be used by State designated endangered or threatened species Habitat known to be used by a species under review as to its Federal endangered or threatened status Coastal Barrier (partially developed) Federally designated Scenic or Wild River	50
	State land designated for wildlife or game management State designated Scenic or Wild River State designated Natural Area Particular areas, relatively small in size, important to maintenance of unique biotic communities	25
✓	State designated areas for the protection of maintenance of aquatic life under the Clean Water Act	5
✓	Wetlands See SI Table 14 (Surface Water Pathway) or SI Table 23 (Air Pathway)	

\* Check (✓) all environments impacted or potentially impacted by the site.

## SI TABLE 14 (HRS TABLE 4-24): SURFACE WATER WETLANDS FRONTAGE VALUES

*	Total Length of Wetlands	Assigned Value
	Less than 0.1 mile	0
✓	0.1 to 1 mile	25
	Greater than 1 to 2 miles	50
	Greater than 2 to 3 miles	75
	Greater than 3 to 4 miles	100
	Greater than 4 to 8 miles	150
	Greater than 8 to 12 miles	250
	Greater than 12 to 16 miles	350
	Greater than 16 to 20 miles	450
	Greater than 20 miles	500

\* Check (✓) highest value.

Notes:

**SURFACE WATER PATHWAY (concluded)**  
**WASTE CHARACTERISTICS, THREAT, AND PATHWAY SCORE SUMMARY**

**WASTE CHARACTERISTICS**

Score

11. If an Actual Contamination Target (drinking water, human food chain, or environmental threat) exists for the watershed, assign the calculated hazardous waste quantity score, or a score of 100, whichever is greater.

100

12. Assign the highest value from SI Table 7 (observed release) or SI Table 3 (no observed release) for the hazardous substance waste characterization factors below. Multiply each by the surface water hazardous waste quantity score and determine the waste characteristics score for each threat.

Substance(s):	See Notes	See Notes (b)	See Notes (c)
Value:	10,000	500,000,000	500,000,000
From Table:	7	7	7

13. Multiply the toxicity and hazardous waste quantity scores. Assign the waste characteristic score for each threat from the table below.

Product	WC Score	DWT	HFCT	ET
0	0			
> 0 to < 10	1			
≥ 10 to < 100	2			
≥ 100 to < 1,000	3			
≥ 1,000 to < 10,000	6			
≥ 10,000 to < 1E+05	10			
≥ 1E+05 to < 1E+06	18			
≥ 1E+06 to < 1E+07	32	✓		
≥ 1E+07 to < 1E+08	56			
≥ 1E+08 to < 1E+09	100			
≥ 1E+09 to < 1E+10	180			
≥ 1E+10 to < 1E+11	320		✓	✓
≥ 1E+11 to < 1E+12	560			
≥ 1E+12 or greater	1000			

\* Check (✓) the WC score calculated for each threat

	Substance Value		HWQ		Product	WC Score (from Table)	
Drinking Water Threat Toxicity/Persistence	10,000	x	100	=	1 x 10 <sup>6</sup>	32	(Max. of 100)
Food Chain Threat Toxicity/Persistence Bioaccumulation	5 x 10 <sup>8</sup>	x	100	=	5 x 10 <sup>10</sup>	320	(Max. of 100)
Environmental Threat Ecotoxicity/Persistence/ Ecobioaccumulation	5 x 10 <sup>8</sup>	x	100	=	5 x 10 <sup>10</sup>	320	(Max. of 100)

Notes: Above substances include (a) benzo(a)pyrene, arsenic, barium, beryllium, cadmium, chromium, lead, and mercury; (b) benzo(b)fluoranthene, benzo(a)pyrene and mercury; and (c) 4,4'-DDE, benzo(a)pyrene, mercury, and 4,4'-DDT.

## SURFACE WATER PATHWAY THREAT SCORES

Threat	Likelihood of Release (LR) Score	Targets (T) Score	Pathway Waste Characteristics (WC) Score (determined above)	Threat Score $\frac{LR \times T \times WC}{82,500}$	
Drinking Water (DW)	550	5	32	1.07	(max. of 100)
Human Food Chain (HFC)	550	45	320	96.00	(max. of 100)
Environmental (E)	550	5.03	320	10.73	(max. of 100)

Multiply LR by T and by WC. Divide the product by 82,500 for each threat (T). Sum the threat scores to obtain the surface water pathway score for each watershed/migration route. Select the highest watershed/migration route score. If the pathway score is greater than 100, assign 100.

### SURFACE WATER PATHWAY CALCULATION: (DW + HFC + E) =

100

(maximum of 100)

Drinking Water Threat:  $\frac{550 \times 5 \times 32}{82,500} = 1.07$

Human Food Chain Threat:  $\frac{550 \times 45 \times 320}{82,500} = 96.00$

Environmental Threat:  $\frac{550 \times 5.03 \times 320}{82,500} = 10.73$

SI Table 15a: SOIL EXPOSURE OBSERVED RELEASE SUBSTANCES

Sample ID	Hazardous Substance	Substance Conc. (mg/kg)	Background Sample ID	Background Conc. (mg/kg)	Toxicity	References
IA-6	Methylene chloride	1.3 J	WBG2-4	0.015 B	10	30
IA-6	Vinyl chloride	1.0 J	WBG2-4	0.012 U	10,000	30
IA-6	Acetone	1.4 J	WBG2-4	0.031 B	10	30
IA-6	trans-1,2-Dichloroethene	6.9	WBG2-4	0.006 U	100	30
IA-6	2-Butanone	0.35 J	WBG2-4	0.012 U	10	30
IA-6	Tetrachloroethene	37	WBG2-4	0.006 U	100	30
IA-6	Toluene	0.48 J	WBG2-4	0.006 U	10	30
IA-6	Phenanthrene	1.2 B	WBG2-4	0.38 U	NL	30
IA-6	Fluoranthene	2.3 B	WBG2-4	0.38 J	100	30
IA-6	Pyrene	1.9 B	WBG2-4	0.38 J	100	30
IA-6	Benzo(a)anthracene	1.2	WBG2-4	0.38 J	1,000	30
IA-6	Bis(2-ethylhexyl)phthalate	4.0	WBG2-4	0.38 U	100	30
IA-6	Chrysene	1.4	WBG2-4	0.38 U	NL	30
IA-6	Benzo(b)fluoranthene	1.6	WBG2-4	0.38 U	10,000	30
IA-6	Antimony	242	WBG2-4	4.4 U	10,000	30
IA-6	Arsenic	13.0	WBG2-4	0.20 B	10,000	30
IA-6	Barium	2,060	WBG2-4	98.0	10,000	30
IA-6	Beryllium	0.5 B	WBG2-4	0.1 U	10,000	30
IA-6	Cadmium	5.1	WBG2-4	0.3 U	10,000	30
IA-6	Calcium	6,160	WBG2-4	682 B	NL	30
IA-6	Chromium	109	WBG2-4	5.2	10,000	30
IA-6	Cobalt	15.0 B	WBG2-4	2.0 B	1	30
IA-6	Copper	1,790	WBG2-4	19.6	NL	30
IA-6	Iron	23,400	WBG2-4	4,370	NL	30
IA-6	Lead	3,830	WBG2-4	5.8	10,000	30
IA-6	Manganese	4,040	WBG2-4	174	10,000	30
IA-6	Mercury	3.9	WBG2-4	0.45	10,000	30
IA-6	Nickel	85.0	WBG2-4	3.4 B	100	30
IA-6	Selenium	0.4 B	WBG2-4	0.2 U	100	30
IA-6	Silver	8.2	WBG2-4	0.6 U	100	30
IA-6	Sodium	49.0 B	WBG2-4	7.3 U	NL	30
IA-6	Vanadium	43.0	WBG2-4	9.8	100	30
IA-6	Zinc	4,250	WBG2-4	103	10	30
				Highest Toxicity	10,000	

Notes:

NA = Background Sample Not Available

J = Value approximate due to limitations identified during the quality control review

B qualifier indicates the compound/analyte was detected in a blank sample. The analytical result for this compound/analyte was not validated according to CLP protocol; some of the above substances might not meet observed release criteria.

Benzo(b)fluoranthene = 3,4-Benzofluoranthene

Soil sampling data available from seven separate sampling events. A complete list of hazardous substances is found in SI Table 3.

Above soil sampling data from 1988 RIS performed by Malcolm Pirnie.

The following substances were detected in soil samples collected by Malcolm Pirnie and may be within two feet of the ground surface: 1,1,1-trichloroethane, chloroform, trichloroethene, benzene, 1,1,2,2-tetrachloroethane, xylenes, ethylbenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2,4-dinitrotoluene, 2,4-dichlorophenol, 1,2-dichloropropane, 1,2-dichloroethane, di-n-butylphthalate, di-n-octylphthalate, 1,2,4-nitrosodiphenylamine, Aroclor-1248, Aroclor-1260, aluminum, magnesium, and thallium.

SCDM Version: June 1994

**SI Table 15b: SOIL EXPOSURE RESIDENT POPULATION TARGETS**

Residence ID:		Level I/Level II		Population				
Sample ID	Hazardous Substance	Substance Concentration (mg/kg)	Cancer Risk Concentration (mg/kg)	% of Cancer Risk Conc.	RfD (mg/kg)	% of RfD	Toxicity Value	References
Sum of Percents					Sum of Percents			

## SOIL EXPOSURE PATHWAY

There are no residences, schools, or day-care facilities on site or within 200 feet of the property. There are no recreational facilities on the property. No persons work onsite [3]. Approximately 15,319 persons live within 1 mile of the property [22]. Access to the property is restricted by a maintained chain-link fence [3]. No terrestrial sensitive environments exist in the area of observed contamination.

Results of soil sampling at the Pine Swamp property for the 1988 Remedial Investigation Study performed by Malcolm Pirnie for Olin indicated the presence of VOCs, SVOCs, and inorganic analytes within 2 feet of the ground surface. Several source areas, including the West Burning Grounds, the Southeast Kettle, the Shotgun Proofing Area, and the Trap Sands, have been excavated after sampling was performed for the RIS [27,30].

# SOIL EXPOSURE PATHWAY WORKSHEET

## RESIDENT POPULATION THREAT

### LIKELIHOOD OF EXPOSURE

	Score	Data Type	Refs
1. OBSERVED CONTAMINATION: If evidence indicates presence of observed contamination (depth of 2 feet or less), assign a score of 550; otherwise, assign a 0. Note that a likelihood of exposure score of 0 results in a soil exposure pathway score of 0.	550	H	27,30

LE =

550

### TARGETS

<p>2. RESIDENT POPULATION: Determine the number of people occupying residences or attending school or daycare on this property and within 200 feet of areas of observed contamination (HRS section 5.1.3).</p> <p>Level I: _____ people x 10 = _____</p> <p>Level II: _____ people x 1 = _____</p> <p style="text-align: right;">Sum =</p>	0	H	3												
<p>3. RESIDENT INDIVIDUAL: Assign a score of 50 if any Level I resident population exists. Assign a score of 45 if there are Level II targets but no Level I targets. If no resident population exists (i.e., no Level I or Level II targets), assign 0 (HRS Section 5.1.3).</p>	0	H	3												
<p>4. WORKERS: Assign a score from the table below for the total number of workers at the site and nearby facilities and within areas of observed contamination associated with the site.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Number of Workers</th> <th style="width: 50%;">Score</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> </tr> <tr> <td>1 to 100</td> <td>5</td> </tr> <tr> <td>101 to 1,000</td> <td>10</td> </tr> <tr> <td>&gt; 1,000</td> <td>15</td> </tr> </tbody> </table>	Number of Workers	Score	0	0	1 to 100	5	101 to 1,000	10	> 1,000	15	0	H	3		
Number of Workers	Score														
0	0														
1 to 100	5														
101 to 1,000	10														
> 1,000	15														
<p>5. TERRESTRIAL SENSITIVE ENVIRONMENTS: Assign a value for each terrestrial sensitive environment (SI Table 16) in an area of observed contamination.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Terrestrial Sensitive Environment Type</th> <th style="width: 50%;">Value</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table> <p style="text-align: right;">Sum =</p>	Terrestrial Sensitive Environment Type	Value											0	H	26
Terrestrial Sensitive Environment Type	Value														
<p>6. RESOURCES: Assign a score of 5 if any one or more of the following resources is present on area of observed contamination at the site; assign 0 if none applies.</p> <ul style="list-style-type: none"> <li>• Commercial agriculture</li> <li>• Commercial silviculture</li> <li>• Commercial livestock production or commercial livestock grazing</li> </ul>	0	H	3												
Sum of Targets T =		0													

Notes: Soil sampling performed in 1980, 1984, 1986, 1987, 1990, and 1992 [1,6,27,30,31]



# SOIL EXPOSURE PATHWAY WORKSHEET

## NEARBY POPULATION THREAT

### LIKELIHOOD OF EXPOSURE

		Score	Data Type	Ref.
7.	Attractiveness/Accessibility (from SI Table 17 or HRS Table 5-6)	Value: 25	H	3
	Area of Contamination (from SI Table 18 or HRS Table 5-7)	Value: 20	H	30
	Area of Contamination = 4 acres = 174,240 ft <sup>2</sup>			
	Likelihood of Exposure (from SI Table 19 or HRS Table 5-8)			
	LE =	5		

### TARGETS

		Score	Data Type	Ref.
8.	Assign a score of 0 if Level I or Level II resident individual has been evaluated or if no individuals live within 1/4 mile travel distance of an area of observed contamination. Assign a score of 1 if nearby population is within 1/4 mile travel distance and no Level I or Level II resident population has been evaluated.	1	H	3
9.	Determine the population within 1 mile travel distance that is not exposed to a hazardous substance from the site (i.e., properties that are not determined to be Level I or Level II); record the population for each distance category in SI Table 20 (HRS Table 5-10). Sum the population values and multiply by 0.1.	18	E	22
	T =	19		

Notes:

**SI TABLE 16 (HRS TABLE 5-5): SOIL EXPOSURE PATHWAY  
TERRESTRIAL SENSITIVE ENVIRONMENT VALUES**

*	TERRESTRIAL SENSITIVE ENVIRONMENT	ASSIGNED VALUE
	Terrestrial critical habitat for Federal designated endangered or threatened species National Park Designated Federal Wilderness Area National Monument	100
	Terrestrial habitat known to be used by Federal designated or proposed threatened or endangered species National Preserve (terrestrial) National or State terrestrial Wildlife Refuge Federal land designated for protection of natural ecosystems Administratively proposed Federal Wilderness Area Terrestrial areas utilized by large or dense aggregations of animals (vertebrate species) for breeding	75
	Terrestrial habitat used by State designated endangered or threatened species Terrestrial habitat used by species under review for Federal designated endangered or threatened status	50
	State lands designated for wildlife or game management State designated Natural Areas Particular areas, relatively small in size, important to maintenance of unique biotic communities	25

\* - Check (✓) all environments impacted or potentially impacted by the site.

Notes:

**SI TABLE 17 (HRS TABLE 5-6);  
ATTRACTIVENESS/ACCESSIBILITY VALUES**

*	Area of Observed Contamination	Assigned Value
	Designated recreational area	100
	Regularly used for public recreation (for example, vacant lots in urban area)	75
	Accessible and unique recreational area (for example, vacant lots in urban area)	75
	Moderately accessible (may have some access improvements-for example, gravel road) with some public recreation use	50
✓	Slightly accessible (for example, extremely rural area with no road improvement) with some public recreation use	25
	Accessible with no public recreation use	10
	Surrounded by maintained fence or combination of maintained fence and natural barriers	5
	Physically inaccessible to public, with no evidence of public recreation use	0

\* Check (✓) highest value.

**SI TABLE 18 (HRS TABLE 5-7): AREA OF CONTAMINATION FACTOR  
VALUES**

*	Total area of the areas of observed contamination (square feet)	Assigned Value
	≤ to 5,000	5
✓	> 5,000 to 125,000	20
	> 125,000 to 250,000	40
	> 250,000 to 375,000	60
	> 375,000 to 500,000	80
	> 500,000	100

\* Check (✓) highest value.

Notes: The Pine Swamp property is surrounded by a maintained fence. However, trespassers use the onsite ponds for fishing.

**SI TABLE 19 (HRS TABLE 5-8): NEARBY POPULATION LIKELIHOOD OF EXPOSURE FACTOR VALUES**

Area of Contamination Factor Value	Attractiveness/Accessibility Factor Value						
	100	75	50	25	10	5	0
100	500	500	375	250	125	50	0
80	500	375	250	125	50	25	0
60	375	250	125	50	25	5	0
40	250	125	50	25	5	5	0
20	125	50	25	5	5	5	0
5	50	25	5	5	5	5	0

**SI TABLE 20 (HRS TABLE 5-10): DISTANCE-WEIGHTED POPULATION VALUES FOR NEARBY POPULATION THREAT**

Travel Distance Category (miles)	Pop.	Number of people within the travel distance category												Pop. Value
		0	1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,001	10,001 to 30,000	30,001 to 100,000	100,001 to 300,000	300,001 to 1,000,000	
Greater than 0 to 1/4	399	0	0.1	0.4	1.0	4	13	41	130	408	1,303	4,081	13,034	13
Greater than 1/4 to 1/2	3119	0	0.05	0.2	0.7	2	7	20	65	204	652	2,041	6,517	65
Greater than 1/2 to 1	11,801	0	0.02	0.1	0.3	1	3	10	33	102	326	1,020	3,258	102
Sum =														180

References: 22

Notes:

# SOIL EXPOSURE PATHWAY WORKSHEET (concluded)

WASTE CHARACTERISTICS	SCORE																																	
10. Assign the hazardous waste quantity score calculated for soil exposure	10																																	
11. Assign the highest toxicity value from SI Table 15a.*  Substance(s): <u>See Notes</u> Value: <u>10,000</u> From Table: <u>Table 3</u>																																		
12. Multiply the toxicity and hazardous waste quantity scores. Assign the Waste Characteristics score from the table below:  <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th>Product</th> <th>WC Score</th> <th>*</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td></td></tr> <tr><td>&gt;0 to &lt;10</td><td>1</td><td></td></tr> <tr><td>≥10 to &lt;100</td><td>2</td><td></td></tr> <tr><td>≥100 to &lt;1,000</td><td>3</td><td></td></tr> <tr><td>≥1,000 to &lt;10,000</td><td>6</td><td></td></tr> <tr><td>≥10,000 to &lt;1E + 05</td><td>10</td><td></td></tr> <tr><td>≥1E + 05 to &lt;1E + 06</td><td>18</td><td>✓</td></tr> <tr><td>≥1E + 06 to &lt;1E + 07</td><td>32</td><td></td></tr> <tr><td>≥1E + 07 to &lt;1E + 08</td><td>56</td><td></td></tr> <tr><td>1E ≥ + 08 or greater</td><td>100</td><td></td></tr> </tbody> </table> <p>* Check (✓) the WC score calculated for the pathway</p>	Product	WC Score	*	0	0		>0 to <10	1		≥10 to <100	2		≥100 to <1,000	3		≥1,000 to <10,000	6		≥10,000 to <1E + 05	10		≥1E + 05 to <1E + 06	18	✓	≥1E + 06 to <1E + 07	32		≥1E + 07 to <1E + 08	56		1E ≥ + 08 or greater	100		
Product	WC Score	*																																
0	0																																	
>0 to <10	1																																	
≥10 to <100	2																																	
≥100 to <1,000	3																																	
≥1,000 to <10,000	6																																	
≥10,000 to <1E + 05	10																																	
≥1E + 05 to <1E + 06	18	✓																																
≥1E + 06 to <1E + 07	32																																	
≥1E + 07 to <1E + 08	56																																	
1E ≥ + 08 or greater	100																																	
WC =	18																																	

## RESIDENT POPULATION THREAT SCORE:

(Likelihood of Exposure, Question 1; Targets = Sum of Questions 2, 3, 4, 5, 6)  $\frac{550 \times 0 \times 18}{82,500} = 0$   $\frac{LE \times T \times WC}{82,000} =$  0

## NEARBY POPULATION THREAT SCORE:

(Likelihood of Exposure, Question 7; Targets = Sum of Questions 8,9)  $\frac{5 \times 19 \times 18}{82,500} = 0$   $\frac{LE \times T \times WC}{82,000} =$  0.02

## SOIL EXPOSURE PATHWAY SCORE:

Resident Population Threat + Nearby Population Threat = 0.02  
(maximum of 100)

Notes: Substances from SI Table 3 with a toxicity of 10,000 include dibromomethane, trans-1,3-dichloropropylene, PCB, benzo(b)fluoranthene, benzo(a)pyrene, vinyl chloride, manganese, arsenic, lead, mercury, cadmium, chromium, and barium.

**SI Table 21a: AIR PATHWAY OBSERVED RELEASE SUBSTANCES**

Sample ID	Hazardous Substance	Substance Concentration	Bckgrd. ID.	Bckgrd. Conc.	Toxicity/Mobility	References

Notes:

Highest Toxicity/Mobility

**SI Table 21b: AIR PATHWAY ACTUAL CONTAMINATION TARGETS**

Sample ID:

Level I:

Level II:

Distance from Sources (mi):

Hazardous Substance	Conc. (µg/m3)	Gaseous Particulate	Benchmark Conc. (NAAQS or NESHAPS)	% of Benchmark	Cancer Risk Conc.	% of Cancer Risk Conc.	RfD	% of RfD
	Highest Tox./ Mobility		Highest Percent		Sum of Percents		Sum of Percents	

Sample ID:

Level I:

Level II:

Distance from Sources (mi):

Hazardous Substance	Conc. (µg/m3)	Gaseous Particulate	Benchmark Conc. (NAAQS or NESHAPS)	% of Benchmark	Cancer Risk Conc.	% of Cancer Risk Conc.	RfD	% of RfD
	Highest Tox./ Mobility		Highest Percent		Sum of Percents		Sum of Percents	

SCDM Version:  
References:  
Notes:

## AIR PATHWAY

The nearest resident is on Leeder Hill Drive abutting Pine Swamp's eastern property boundary. There are an estimated 178,899 persons living within 4 miles of Pine Swamp. Sensitive environments within 4 miles of the Pine Swamp property include 11 federally endangered species, 3 federally threatened species, and approximately 29 acres of wetlands [26,46]. No air sampling was conducted at the Pine Swamp property. In addition, no air sampling was performed during the previous site activities. During CDM site reconnaissance and sampling activities, monitoring equipment detected no organic vapors [3].

# AIR PATHWAY WORKSHEET

## LIKELIHOOD OF RELEASE

	Score	Data Type	Refs
1. <b>OBSERVED RELEASE:</b> If sampling data or direct observation support a release to air, assign a score of 550. Record observed release substances on SI Table 21.	0	--	--
2. <b>POTENTIAL TO RELEASE:</b> If sampling data do not support a release to the air, assign a score of 500. Optionally, evaluate air migration gaseous and particulate potential to release (HRS Section 6.1.2)	500	--	--
<b>LR =</b>	500		

## TARGETS

TARGETS	Score	Data Type	Refs																
<p>3. ACTUAL CONTAMINATION POPULATION: Determine the number of people within the target distance limit subject to exposure from a release of a hazardous substance to the air.</p> <p>Level I: _____ people x 10 = _____</p> <p>Level II: _____ people x 1 = _____</p> <p style="text-align: right;">Total = 0</p>	0	--	--																
<p>4. POTENTIAL TARGET POPULATION: Determine the number of people within the target distance limit not subject to exposure from a release of a hazardous substance to the air, sum the population values, and then multiply the total population score from SI Table 22 by 0.1.</p>	113.3	E	22																
<p>5. NEAREST INDIVIDUAL: Assign a score of 50 if there are any Level I targets. Assign a score of 45 if there are Level II targets but no Level I targets. If no Actual Contamination Population exists, assign the Nearest Individual score from SI Table 22.</p>	20	E	22,30																
<p>6. ACTUAL CONTAMINATION SENSITIVE ENVIRONMENTS: Sum the sensitive environment values (SI Table 13) and wetland acreage values (SI Table 23) for environments subject to exposure from the release of a hazardous substance to the air.</p> <table><tr><th>Sensitive Environment Type</th><th>Value</th></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><th>Wetland Acreage</th><th>Value</th></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr></table>	Sensitive Environment Type	Value							Wetland Acreage	Value							0	--	--
Sensitive Environment Type	Value																		
Wetland Acreage	Value																		
<p>7. POTENTIAL CONTAMINATION SENSITIVE ENVIRONMENTS: Use SI Table 24 to evaluate sensitive environments not subject to exposure from a release.</p>	1.078	E	30																
<p>8. RESOURCES: Assign a score of 5 if one or more air resources applies within 1/2 mile of a source; assign a 0 if none applies</p> <ul style="list-style-type: none"><li>• Commercial agriculture</li><li>• Commercial silviculture</li><li>• Major or designated recreation area</li></ul>	5	H	44,45, 46,47																
<p style="text-align: right;">T =</p>	139.4																		

Notes:



**SI TABLE 22 (From HRS TABLE 6-17): VALUES FOR POTENTIAL CONTAMINATION AIR TARGET POPULATIONS**

Distance From Site	Pop.	Nearest Individual (choose highest)	Number of People within the Distance Category												Pop. Value
			1 to 10	11 to 30	31 to 100	101 to 300	301 to 1,000	1,001 to 3,000	3,001 to 10,000	10,001 to 30,000	30,001 to 100,000	100,001 to 300,000	300,001 to 1,000,000	1,000,001 to 3,000,000	
On a source	0	20	4	17	53	164	522	1,633	5,214	16,325	52,137	163,246	521,360	1,632,455	0
0 to 1/4 mile	399	*	1	4	13	41	131	408	1,304	4,081	13,034	40,832	130,340	408,114	131
> 1/4 to 1/2 mile	3,119	2	0.2	0.9	3	9	28	88	282	882	2,815	8,815	28,153	88,153	282
> 1/2 to 1 mile	11,801	1	0.06	0.3	0.9	3	8	26	83	261	834	2,612	8,342	26,119	261
> 1 to 2 miles	40,972	0	0.02	0.09	0.3	0.8	3	8	27	83	266	833	2,659	8,326	266
> 2 to 3 miles	68,297	0	0.009	0.04	0.1	0.4	1	4	12	38	120	375	1,199	3,755	120
> 3 to 4 miles	54,311	0	0.005	0.02	0.07	0.2	0.7	2	7	28	73	229	730	2,285	73
Nearest Individual =		20	Sum =												1133

\*Score = 20 if the Nearest Individual is within 1/8 mile of a source; score = 7 if the Nearest Individual is between 1/8 and 1/4 mile of a source.

References: 22,30

Notes:

**SI TABLE 23 (HRS TABLE 6-18): AIR PATHWAY VALUES FOR WETLAND AREA**

*	Wetland Area	Assigned Value
	< 1 acre	0
✓	1 to 50 acres	25
	> 50 to 100 acres	125
	> 100 to 150 acres	125
	> 150 to 200 acres	175
	> 200 to 300 acres	250
	> 300 to 400 acres	350
	> 400 to 500 acres	450
	> 500 acres	500

\* Check (✓) highest value.

**SI TABLE 24: DISTANCE WEIGHTS AND CALCULATIONS FOR AIR PATHWAY POTENTIAL CONTAMINATION SENSITIVE ENVIRONMENTS**

Distance	Distance Weight	Sensitive Environment Type and Value (from SI Tables 13 and 20)	Product
On a Source	0.10	x	0
		x	
0 to 1/4 mile	0.025	x Onsite Ponds CWA Protection 5	0.125
		x	
		x	
1/4 to 1/2 mile	0.0054	x	
		x	
		x	
1/2 to 1 mile	0.0016	x Federal Critical Habitat 2 x 100	0.32
		x	
		x	
1 to 2 miles	0.0005	x Mill River Wetland Area 25	0.013
		x Federal Critical Habitat 10 x 100	0.013
			0.50
2 to 3 miles	0.00023	x Federal Critical Habitat 4 x 100	0.092
		x	
		x	
3 to 4 miles	0.00014	x Federal Critical Habitat 2 x 100	0.028
		x	
		x	
> 4 miles	0	x	
Total Environments Score =			1.078

Notes: Onsite wetland areas are less than 1 acre. Mill River Wetland Areas total approximately 29 acres.

## AIR PATHWAY (concluded)

WASTE CHARACTERISTICS	SCORE																																	
9. If any Actual Contamination Targets exist for the air pathway, assign the calculated hazardous waste quantity score or a score of 100, whichever is greater; if there are no Actual Contamination Targets for the air pathway, assign the calculated HWQ score for sources available for air migration.	10																																	
10. Assign the highest air toxicity/mobility value from SI Table 21a or SI Table 3.  Substance(s): <u>See Below</u> Value: <u>10,000</u> From Table: <u>Table 3</u>	10,000																																	
11. Multiply the toxicity and hazardous waste quantity scores. Assign the Waste Characteristics score from the table below:  <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Product</th> <th>WC Score</th> <th>*</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td></td></tr> <tr><td>&gt;0 to &lt;10</td><td>1</td><td></td></tr> <tr><td>≥10 to &lt;100</td><td>2</td><td></td></tr> <tr><td>≥100 to &lt;1,000</td><td>3</td><td></td></tr> <tr><td>≥1,000 to &lt;10,000</td><td>6</td><td></td></tr> <tr><td>≥10,000 to &lt;1E + 05</td><td>10</td><td></td></tr> <tr><td>≥1E + 05 to &lt;1E + 06</td><td>18</td><td>✓</td></tr> <tr><td>≥1E + 06 to &lt;1E + 07</td><td>32</td><td></td></tr> <tr><td>≥1E + 07 to &lt;1E + 08</td><td>56</td><td></td></tr> <tr><td>≥1E + 08 or greater</td><td>100</td><td></td></tr> </tbody> </table> <p style="margin-top: 10px;">* Check (✓) the WC score calculated for the pathway</p>	Product	WC Score	*	0	0		>0 to <10	1		≥10 to <100	2		≥100 to <1,000	3		≥1,000 to <10,000	6		≥10,000 to <1E + 05	10		≥1E + 05 to <1E + 06	18	✓	≥1E + 06 to <1E + 07	32		≥1E + 07 to <1E + 08	56		≥1E + 08 or greater	100		
Product	WC Score	*																																
0	0																																	
>0 to <10	1																																	
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≥1E + 05 to <1E + 06	18	✓																																
≥1E + 06 to <1E + 07	32																																	
≥1E + 07 to <1E + 08	56																																	
≥1E + 08 or greater	100																																	
<b>WC =</b>	<b>18</b>																																	

Multiply LR by T and by WC. Divide the product by 82,500 to obtain the air migration pathway score. If the pathway score is greater than 100, assign 100.

**AIR MIGRATION PATHWAY CALCULATION:**

$$\frac{LR \times T \times WC}{82,500} = 15.21$$

(maximum of 100)

$$\frac{500 \times 139.4 \times 18}{82,500} = 15.21$$

Notes: Substances from SI Table 3 that have an air toxicity/mobility value of 10,000 include dibromomethane, trans-1,3-dichloropropylene, and vinyl chloride.

# SITE SCORE CALCULATION

	S	S <sup>2</sup>
GROUND WATER PATHWAY SCORE (S <sub>GW</sub> )	6.02	36.24
SURFACE WATER PATHWAY SCORE (S <sub>SW</sub> )	100	10,000
SOIL EXPOSURE (S <sub>S</sub> )	0.02	0.0004
AIR PATHWAY SCORE (S <sub>A</sub> )	15.21	231.34
<div> <div>SITE SCORE</div> <div> <math display="block">\sqrt{\frac{S_{GW}^2 + S_{SW}^2 + S_S^2 + S_A^2}{4}}</math> </div> </div>		50.66

## COMMENTS:

As described in the Site Description and Operational History, contamination on the Pine Swamp property has been characterized through numerous groundwater, surface water, sediment, and soil samples collected over the past 14 years. Although much of the sampling was not performed within the past 5 years, annual groundwater sampling from onsite monitoring wells has provided recent data to evaluate the mobility of the contamination. The above analysis was performed assuming actual contamination in the groundwater, surface water, and soil exposure pathways.

Two private drinking water wells, the Dadio well on Putnam Avenue and the Tech Auto well on Connolly Parkway, were sampled on May 15 and 16, 1984 by NUS Corporation. The results showed no detectable VOCs or semivolatile compounds for both the Dadio well, 0.2 mile upgradient of the Pine Swamp property serving 5 persons, and the Tech Auto well, 1.3 miles northeast of the property serving 20 persons. Zinc was detected at 81 ppb in the [REDACTED] well and manganese was detected at 14 ppb in the Tech Auto well. Due to its proximity to the Pine Swamp property, the [REDACTED] well was again sampled on August 23, 1994 by CDM, resulting in the detection of one VOC and several inorganic analytes. The compound and analytes detected were well below Maximum Contaminant Levels. Due to the low concentration of contaminants detected in the [REDACTED] well and the upgradient location of the well was assumed not to be an actual contamination target for the groundwater pathway.

Due to the results of the SIP sediment sampling, performed on August 23, 1994 by CDM, the onsite ponds are a Level II fishery. Based on the investigation performed for the 1988 RIS, fish species present in the onsite pond are blue gill sunfish and pumpkin seed sunfish. Although most contamination was found in sediment sample SD-08, which may be located within the Battery Waste Area, mercury was detected in sediment sample SD-07 at greater than three times the sample detection limit. Therefore, the surface water pathway score would not change is sample SD-08 were not used in the surface water pathway evaluation.

Fish samples were collected by Malcolm Pirnie on July 16 and 17, 1987. The fish were tested for lead concentration and compared with existing baseline data from three rivers in the State of Connecticut. The lead concentrations from onsite fish were within the range of the baseline data and Malcolm Pirnie determined the fish tissue lead level to be negligible. The surface water was also sampled in 1986-87 by NUS Corporation. The results showed no detectable VOCs; no detectable pesticides/PCBs; low concentrations of semivolatile compounds, the highest being 0.019 mg/L diethyl phthalate and 0.018 mg/L bis(2-ethylhexyl)phthalate; and the

presence of inorganic analytes, including aluminum, calcium, copper, iron, lead, magnesium, manganese, mercury, potassium, sodium, and zinc. One sample showed a lead level greater than the Action Level of 15 ppb established by the 1991 EPA Lead and Copper Rule.

**WARNING!!**

EPA has determined that the status and HRS score of any site that is progressing towards listing on the NPL is a pre-decisional, formal rule making process and therefore deliberations regarding listing issues, the site specific status, and HRS scores cannot be released or discussed with non-Agency persons. For additional guidance see the April 30, 1993 OSWER Directive 9320.1-11.

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